Welding Engineer

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SEPTEMBER, 1958

NATIONAL WELDED PRODUCTS MONTH
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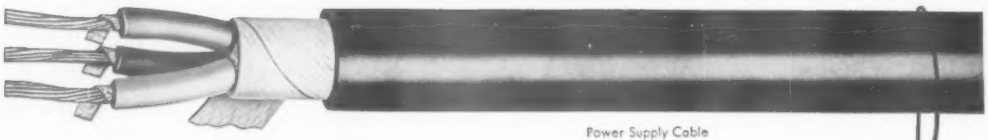

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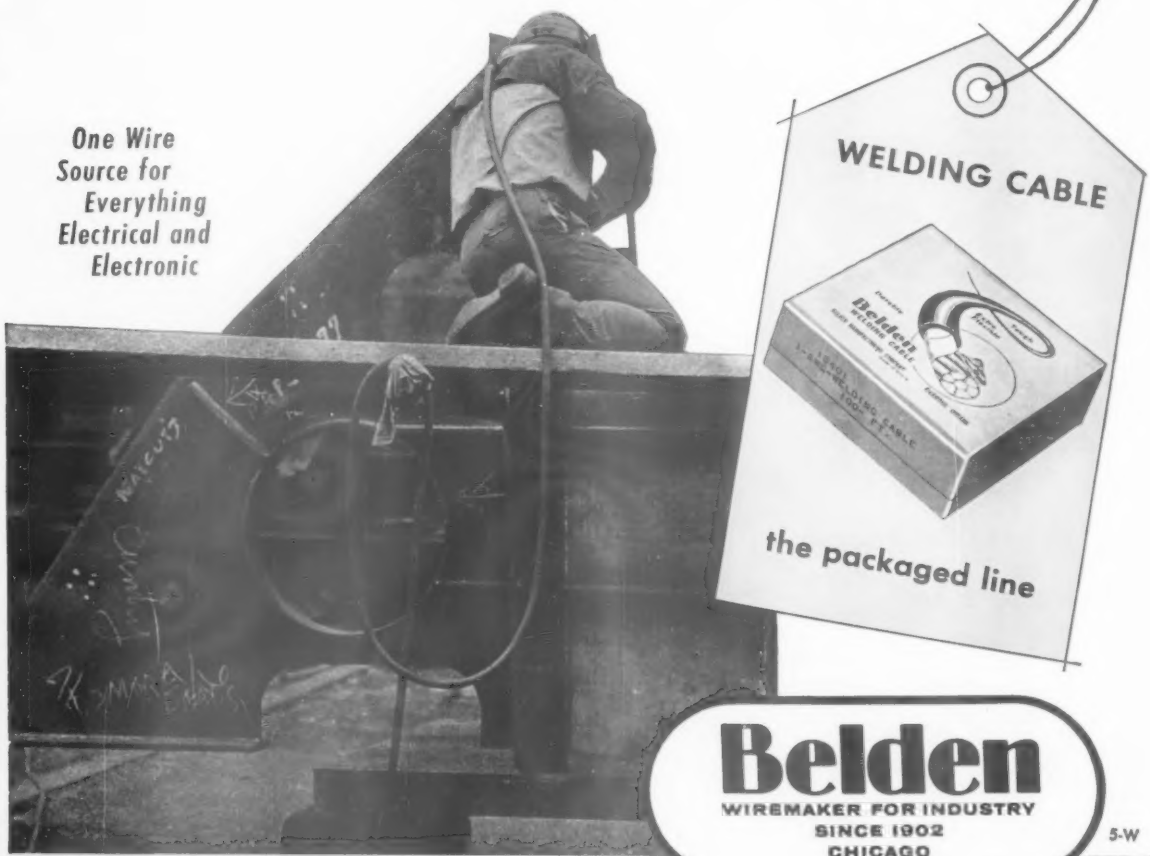

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The "PowrWeld" lets the operator change over from DC welding to AC power without leaving the work—without shouting instructions to a helper. He can take all his welding equipment and tools to the job and work uninterrupted until it is completed. Power to weld and power to use tools, alternately or simultaneously. The only combination of its type on the market today.

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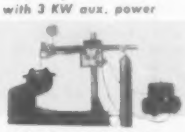
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Vol. 43 — No. 9

Welding Engineer

The magazine of joining and severing materials

This is welding: September, 1958

National Welded Products Month

Photos and facts describe the invaluable uses of welding on products that play an important part in everyone's life at home . . . at play . . . at work . . . on the way . . . and in every way. Observing National Welded Products Month — September, 1958 — this special six-page section begins on page 29

On target—with 2 speedy welding methods 35

Raymond L. Downing tells why Mig and Tig welding and Tig spot welding are strong economy factors in the fabrication of 1,000-lb practice bombs for the U. S. Navy.

Welding is on display at the Brussels World's Fair 36

Here's a graphic trip to the much-publicized Brussels Fair, where welding's use on buildings and balustrades, sculpture and items of artistic scenery, make this metal-joining method an integral part of an international display.

Braze-welding saves an anvil 38

Ten weldors, 72 man-hours and 2,350 lb of bronze welding rod: some of the more important factors contributing to the successful repair of a cracked 60-ton anvil. **R. L. Rectenwald** tells the tale of this surprisingly economical job.

Titanium: proper shielding = sound welds 40

Either the Mig or Tig processes may be used to make consistently good welds on titanium sheets, plates and forgings—but only when the good advice presented here has been put into effect.

Fundamentals of welding engineering 44

T. B. Jefferson discusses welding's job opportunities and the qualifications of a welding engineer—and reviews welding's contributions and its future potential—in this second article of a series.

This fabricator "packs" up his wire troubles 50

Substituting 500-lb packs of welding wire for 25-lb coils, a gondola car manufacturer gives his Mig weldors greater mobility and, reports **R. E. Butler,** earns appreciable savings for himself.

Shift to welded joints for small-diameter pipe 52

H. A. Sosnin compares and contrasts mechanical and welded pipe joints to point-up the reasons why pipe fabricators are indicating an increasing preference for the stronger, less costly joints made possible by welding.

Also in this issue:

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New steel and welding aid mining machines 58

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Welding Engineer

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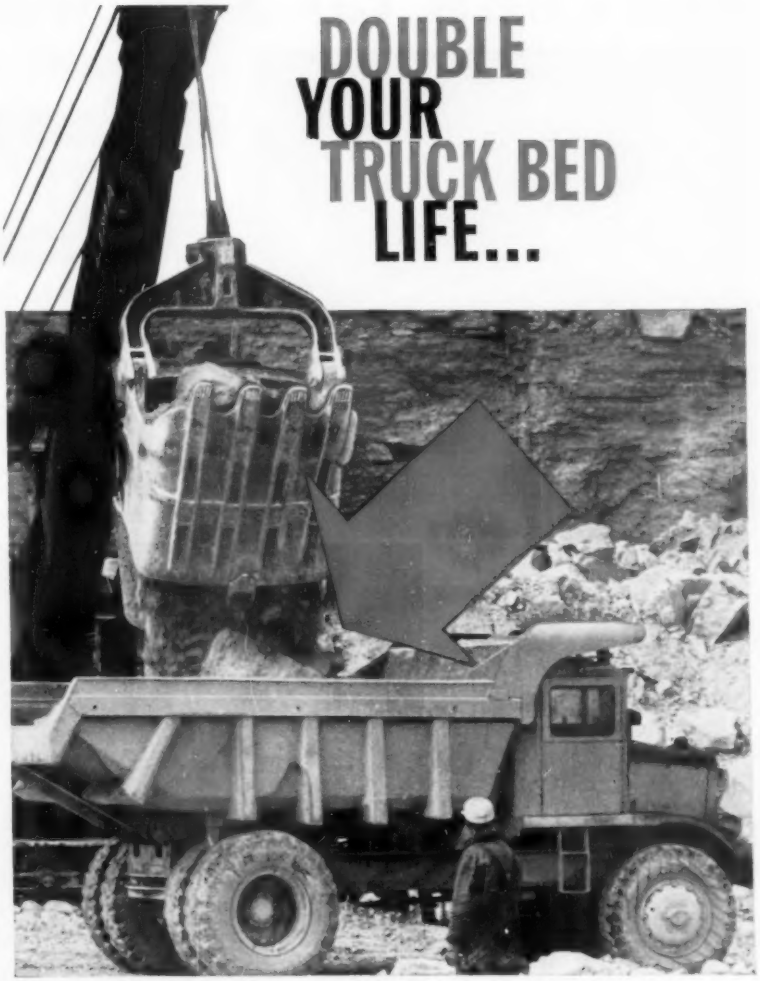

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Amsco manganese steel plate is easy to weld, easy to cut with an oxyacetylene torch.

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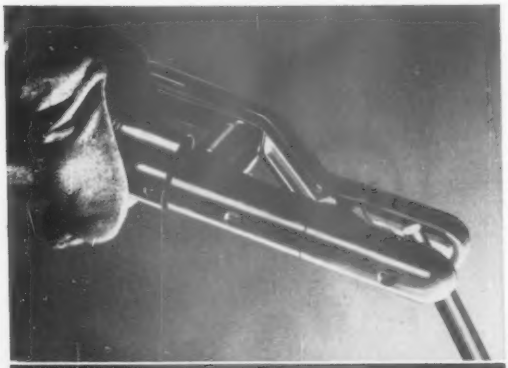


Insulated Copper Alloy Holders have greatest strength, hardness and conductivity. Jackson insulators have highest heat and impact resistance. Choose them where greater duty cycles are called for.

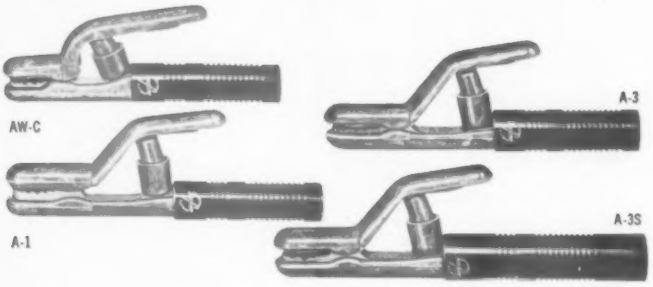
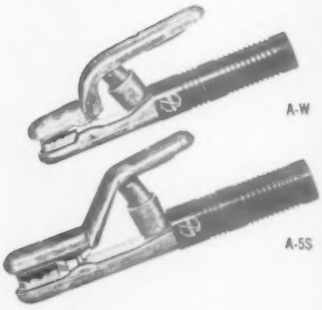


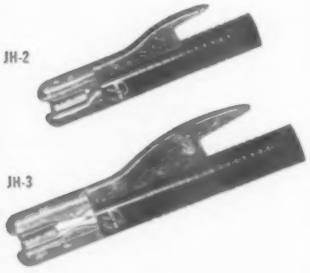
Table shows duty cycles possible with Jackson Insulated Copper Alloy Holders, using electrodes and cables shown.

Holder Class	Model	Electrode	Amps & Cable	Amps & Cable	Duty Cycle
Small	AW-C	7/32"	250—No. 1	300—1/0	50%
Medium	A-1	1/4"	300—1/0	350—2/0	50%
Large	A-3	3/8"	375—2/0	450—3/0	65%
Heavy-Duty	A3-S	3/8"	500—4/0		80%



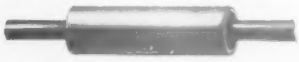
Featherlight medium class model A-W takes electrodes through 1/4" at 300 amps, weighs 14 oz. Featherlight larger model A-5S has wider tong and wider handle, takes electrodes through 5/16" at 400 amps.

Featherlight Holders have tongs of aluminum alloy, replaceable jaws of high-copper alloy. Excellent all-purpose holders, each within its rated capacity. Cable connection must be made mechanically.



Featherlight and streamlined, small class JH-2 takes electrodes through 5/32" at 200 amps, weighs 9 1/2 oz. Medium class JH-3 takes electrodes through 1/4" at 300 amps.

'Quik-Trik' Cable Connectors 2/0-R and 4/0-R have neoprene rubber insulators with tapered ends to stretch over cable snugly. They lock out moisture and dirt, don't catch against obstructions.



Cable Splicers for permanent connections. Copper alloy with hard fiber insulators.

Cable Lugs of cast copper alloy, 180 and 45 degrees.

Jackson Ground Clamps, Cable Connectors, Splicers and Lugs are available in three sizes:

MODEL	CABLE SIZE	CABLE CONNECTION	CAPACITY
No. 1	4 thru 1/0	Mechanical, soldered, or brazed	300 amps
2/0—R* and 2/0	1/0 and 2/0	Mechanical, soldered, or brazed	500 amps
4/0—R* and 4/0	3/0 and 4/0	Soldered or brazed only	500 amps

*Cable Connectors only

Jackson Ground Clamps give broad metal-to-metal contact. They also fit the hand, go easy on, easy off. Angled socket reduces strain on cable, allows wire fastening for extra support of the cable.

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NEWS

New Jersey proclaims "Welded Products Month"

Three proclamations, one statewide and two local, making September "Welded Products Month," were made in the State of New Jersey.

Gov. Robert B. Meyner signed the statewide proclamation Aug. 21. On the local level, the mayor of Newark, Leo P. Carlin, and the mayor of Livingston, A. C. Axtell signed proclamations. Axtell is also president of Essex Welding Equipment Co., Newark.

One proclamation states, "welding and the welding process are important to the American economy not only for the manufacture of the products we use in every day life, but also for the technological advances in transportation, construction, research and the development of the missile and rocket programs of the country."

It also says that the reason for the proclamation is that welding "has for years remained unobtrusive and unnoticed, and has been taken for granted. It is deemed that the importance of the process of welding and the quality of welded products be brought to the attention of the public at large."

Above, Gov. Meyner and Mayor Carlin. *Below*, Mayor Axtell signs proclamation making September "Welded Products Month" in the township of Livingston.

Proclamation

WELDED PRODUCTS MONTH

WHEREAS, welding and the welding process are important to the American economy not only for the manufacture of the products we use in everyday life but also for the technological advances in transportation, construction, research and the development of the missile and rocket programs of the country; and

WHEREAS, welding, even though such a basic essential to the standard of living and to the economy of this country, has for years remained unobtrusive and unnoticed, and has been taken for granted; and

WHEREAS, it is deemed that the importance of the process of welding and the quality of welded products be brought to the attention of the public at large;

NOW, THEREFORE, I, LEO P. CARLIN, Mayor of The City of Newark, N.J., do hereby proclaim the month of September, 1958 as

WELDED PRODUCTS MONTH

in order that there may be brought to the attention of our people the importance of welding and the quality of welded products and the contribution they make to the welfare and the prosperity of our country and to the wellbeing of all of our citizens.

Leo P. Carlin
MAYOR

Dated August 1, 1958

portance of the process of welding and the quality of welded products be brought to the attention of the public at large."

Mayors of several other locales in other states, including *WE's* headquarters, Illinois, made similar proclamations.

The President of the United States was also told of the importance of welding, and was asked that he proclaim September "National Welded Products Month." But before such a national proclamation can be made, the President must receive a request from Congress in the form of a joint resolution, according to Special White House Assistant Frederic Fox.

Next year *WE* will ask our representative that such a resolution be introduced. In this manner, Sept., 1959, will gain *official government* status as "National Welded Products Month."

Carborundum plans new facilities

Carborundum Co., Niagara Falls, N. Y., has started construction on a $6,000,000 plant that will manufacture 4 to 14 in. grinding wheels.

The plant will not be fully automatic, but will feature some specially designed automatic and semi-automatic equipment, some of which is now ready for delivery to the company.

One such machine does six operations in automatic sequence, and turns out one 4-in.-diameter cup wheel every 17 seconds.

The company has announced that it has plans to build a plant to manufacture other vitrified product lines sometime in the future.

250 exhibitors at "Atoms for peace"

The second international "Atoms for peace" exhibition will be held Sept. 1-14, in the Palais des Expositions in Geneva.

Thirteen countries will provide 250 exhibits for the show, with the U. S. and Great Britain occupying most of the space.

The Mallory-Sharon Metals Corp., Niles, Ohio, will participate in the exhibition.

Its exhibit will feature a graphic animated presentation showing how neutrons readily pass through zirconium, while they are absorbed by its by-product, hafnium.

An illustrated panel will show the step-by-step process by which beach sand is converted into zirconium and hafnium. A chart will show the economic advantages of Zircoloy-2 as a cladding material over stainless steel. This is illustrated in terms of estimated annual savings in direct operating costs for four typical nuclear reactors.

IAA offices change location

The International Acetylene Association, New York City, is returning to offices it occupied prior to July, 1956, when it was located in the 300 Madison Ave. Building. The mailing address of IAA is now 30 E. 42nd St., New York 17, N. Y.

Warehouse-service center opened by Eutectic

A new, modern warehouse-service center to serve Detroit area industry has been established by the Eutectic Welding Alloys Co. of Michigan, Inc.

Eutectic president, Rene Wasserman, said this expansion "is indicative of our faith in the continued industrial progress of Michigan, and the growing demand for better welding products by industry in the state." E. Watnik is in charge.

The new facility will have a free industrial shop consultation-demonstration service of company representatives, and will also be headquarters for a Eutectic Welding Institute, a Technical Information Service, and other services for local industry.

SCHETKY Equipment (Portland, Ore.) Corp.'s new bottom dump unit is made of aluminum and designed for hauling and spreading gravel, hot asphalt mix and other highway construction materials. Unit has a volume of 244 cu ft, and weighs 3,860 lb, empty. Structural frame is made of ¼-inch Kaiser Aluminum alloy 5086 H112 plate, and welded into a box configuration. Welds, made with 5356 wire, are continuous at the corners and intermittent at other locations.

NCG to build oxygen plant

National Cylinder Gas Div., of Chemetron Corp. has started construction of the first industrial gas producing plant in Erie, Pa., on land leased from Erie Forge & Steel Corp.

The new plant will supply oxygen by pipeline to meet the steel-making requirements of Erie Forge & Steel, and assure it an uninterrupted supply.

Oxygen will also be supplied to other industries in the area and to hospitals. Welding supplies, medical equipment and other gases including acetylene will be available from the plant.

Initial capacity will be approximately 7,500,000 cu ft per month, and the plant will be capable of doubling its capacity. Operation is expected to begin by January, 1959.

Narda Ultrasonics buys Alcar firm

An ultrasonics firm founded in 1953, Alcar Instruments Inc., has been acquired by Narda Ultrasonics, Mineola, N. Y. The Little Ferry, N. J., firm will operate as an independent subsidiary of Narda. Benson Carlin continues as president. Sales offices of Alcar will be moved to Narda's headquarters at 118-160 Herricks Road, Mineola.

AWS to participate in ASTE tool show

The American Welding Society will conduct two sessions Oct. 3 during the American Society of Tool Engineers Western Show and Convention in Los Angeles (Sept. 29-Oct. 3). The show will be held in Shrine Exposition Hall, the convention in Biltmore Hotel.

Papers will be presented by Byron Russell, Airline Welding and Engineering; Henry James, Sciaky Bros, Inc.; Gerald Garfield, Research Welding and Engineering Co.; and J. Byron Jones and W. C. Potthoff, Aeroprojects Inc.

Standard shear test for brazed joints wanted

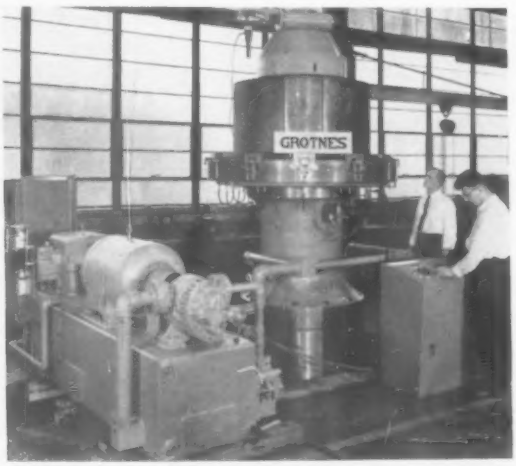
Wall Colmonoy Corp., Detroit, has queried people in the brazing industry on whether or not a standard test for the shear strength of brazed joints is needed. Colmonoy reports that 71% of the people asked feel there is a need for a standard test, 5% recognized no such need, and 24% failed to respond.

Wall Colmonoy representatives presented a paper at the 1958 annual spring meeting of the American Welding Society proposing a standard specimen, a standard procedure and a standard evaluation for testing shear strength of brazed joints be adopted.

After presentation of the paper,

(Continued on page 73)

ALUMINUM mast of the *Columbia* is being butt welded by Tig method. Mast was on *Columbia* when it raced three other 12-meter sloops at Newport, R. I., to see which would have the right to defend America's Cup against British challenger, *Sceptre*. Aluminum was supplied by Aluminum Co. of America, Pittsburgh, and was fabricated by Fuller Brush Co. Machine Division. Masts on other boats, and on the challenger are also aluminum. (The *Columbia* won.)



ONE of largest metal expanders ever constructed is this unit which exerts a drawbar pull of 1,580 tons, and maximum oil pressure of 3,000 psi. Grotnes Machine Works, Inc., Chicago, recently introduced hydraulically-powered machine which, in photo above, is installed in a shallow pit. Machine's 12 jaws can expand 2 in. in diameter with force sufficient to expand 60 sq in. of metal which possess yield strength of 46,000 psi. Expander is of welded design.

The ambulances of Bowers Ambulance Service, of Long Beach, California, are the products of experts. . . .

Among the finest ambulances made in America are those of the Bowers Ambulance Service of Long Beach, California. From Cadillac Chassis to National Oxygen Regulator, no effort has been spared to select only tested, reliable, dependable equipment. When life hangs in the balance no mechanical trouble must have the slightest chance to tilt the scales against the patient.

Regardless of how much money you care to spend, you cannot buy finer single or two-stage reduction regulators than those made by NATIONAL of California. Whether for minute or vast hourly gas requirements, at very low or extremely high delivery pressures, no regulators will give you better service or more trouble-free performance than will . . . . .

Because only the very finest equipment is chosen, National Oxygen Regulators are "standard" here.

National of California

No other regulator is so easy to adjust and no others will hold that pressure adjustment more steadily. Designed and built for the merciful hands of the hospital nurse, the sturdiness of these regulators will withstand the toughest operations in shop or field. Intended to sustain the flickering life of the injured or the ill, it will maintain the finest torch flame adjustment regardless of weather or gas volume.

One touch of the adjusting screw and you will know why NATIONAL of California regulators have won the test of time. Made by an organization with nearly half a century of experience **in the fields of high pressure gas equipment design and manufacture, you can rely upon these products.**

These regulators will require reconditioning but seldom; but, when they do, this job has been so simplified that any competent repair man, anywhere, can do so easily. . .

write for free brochure no. 4 —44 pages packed with interesting information and 30 color and black & white pictures.

NATIONAL welding equipment company... 542 DEPT. 144 218 fremont street san francisco 5 california

Looking for a resistance-welding electrode not easily beat by
sustained heat?

Order AMPCO-WELD® for your high-temperature applications.

Send for catalog, price list, and name of your distributor.

AMPCO®

AMPCO METAL, INC., DEPT. 1871, MILWAUKEE 46, WISCONSIN
WEST COAST PLANT: BURBANK, CALIFORNIA
SOUTHWEST PLANT: GARLAND (DALLAS COUNTY), TEXAS

RW-25

30 YEARS AGO

(Taken from the *Welding Engineer* of September, 1928)

An editorial cites the need for education in engineering schools in the theory, application and design of welding. Schools are lagging behind the industry's progress. The editorial states that graduate engineers do not have the knowledge they should have of the welding processes, thus handicapping themselves and retarding the universal acceptance of welding. (This editorial of 30 years ago could be reprinted today and carry the same meaning, showing up the same weaknesses.)

—30 YEARS AGO—

An article shows how welded aluminum is used in the aircraft industry to make wing and fuselage gas tanks, and a combination pilot seat-oil tank. Welded aluminum engine cowlings are also becoming popular. All joints and fittings are oxyacetylene welded. (Commander Richard Byrd's Bellanca plane, which he took on his 1928 South Pole expedition, was fitted with a welded aluminum gas tank, and oil tank.)

—30 YEARS AGO—

N. L. Nye has been stationed at Akron, Ohio, under the direction of Ray P. Tarbell, manager of the Cleveland district, Lincoln Electric Co.

—30 YEARS AGO—

Brown Bros. Welding Co. took a contract from the Western Pipe and Steel Co. to weld a line going through the Sierra Nevadas. The welding equipment, other than the generators, was furnished by the National Welding Equipment Co., as a subsidiary of the Brown Bros.

—30 YEARS AGO—

National Metal Week, Oct. 8-12, features welding. Wednesday at 10 a.m. R. D. Thomas, chairman of the Philadelphia Section of the American Welding Society, will preside at a technical session during which J. W. Meadowcroft, assistant works manager, Budd Mfg. Co., will present a paper on welding in the automobile industry. Thursday afternoon, papers by J. F. Lincoln, Lincoln Electric Co., on erecting a building by welding, and by H. E. Rockefeller, Linde Air Products Co., on oxyacetylene cutting in the structural field will be presented. A. G. Oehler, past president of AWS, will preside at the meeting.

ASK THE MAN BEHIND THE GLOVE . . .

He'll tell you that
Carol **DYNAPOWER WELDING CABLE**

is the best because of its exceptional flexibility, extraordinary strength, extra-long life . . . and it is readily available from a network of warehouses across the country. Furnished on 500 or 1000 ft. "no-charge" reels or in coils.

When you call for cable — call for Carol.

MEMBER NATIONAL WELDING SUPPLY ASSOCIATION

Carol®

CAROL CABLE COMPANY
Division of the Crescent Company, Inc., Pawtucket, R. I.

for hard surfacing...

McKAY

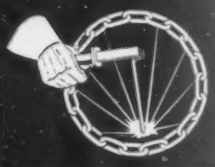
AUTOMATIC & SEMI-AUTOMATIC

tube-alloy® wires

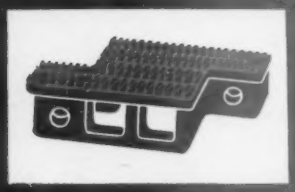
- smooth operation
- high deposition
- uniform, wear-resistant deposits
- controlled chemistry
- wide range of analyses

Years of research, development and experience in welding electrode manufacturing are combined to make McKay "Tube-Alloy" the most efficient and economical wires for automatic and semi-automatic hard surfacing applications. Tube-Alloy wires lay down sound, clean weld deposits of controlled composition and hardness. The closely compacted tubular wires feed smoothly and evenly. Deposition rates are double or more over manual operation . . . thus greatly reducing overall hard surfacing costs.

write for
HARD SURFACING CATALOG

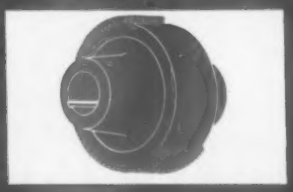


THE McKAY COMPANY • 1005 LIBERTY AVENUE • PITTSBURGH 22, PA.

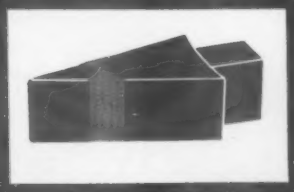


Tractor Rails
TUBE-ALLOY BU WIRE

Ditcher Rollers
TUBE-ALLOY 252



Shovel Rollers
TUBE-ALLOY 258



Shovel Bucket Teeth
TUBE-ALLOY 218

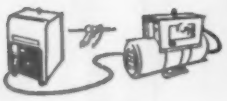
SEPTEMBER
1958

Your

Weld World

at press time

Last minute news of interest to those engaged in joining and severing materials.



. . Picker X-Ray Corp., White Plains, N. Y., has been acquired by C.I.T. Financial Corp., New York City. Picker will continue as autonomous organization. Announcement made by Picker President Harvey Picker and C.I.T. President Arthur O. Dietz stressed that latter firm's financial resources will enable Picker Corp. to expand research and development programs.

. . Structural tests on experimental all-welded truss panels for military tactical bridge are being conducted by Army's Research and Development Laboratories. Alcoa fabricated panels from 5456 plate stock. More details in October's WE

. . Electrode price increase may be in offing, now that steel was hiked from $4.25 to $4.50 a ton. Some manufacturers are playing waiting game, much like steel industry itself did.

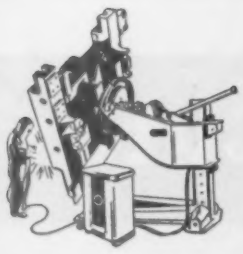
. . With steel and aluminum prices on rise, it was somewhat of surprise when stainless-steel plate was reduced about 6%.

. . Westinghouse says a chemical bond has been achieved between aluminum and electrical porcelain, without additional filler or heat treatment. Seal is achieved by contact of ceramic material at high temperature to molten aluminum.

. . Another Westinghouse achievement: automatic flame-cutter with electronic tracer capable of following pencil-line drawings. It's called "Linatrol."

. . High-strength weldable aluminum alloy is used in hulls of new lightweight armored vehicle being built by Food Machinery & Chemical Corp. for the Army. Kaiser is supplying aluminum to firm's Ordnance Div. at San Jose, Calif.

. . Air Reduction Sales Co., New York City, will build new oxygen and nitrogen producing plant in Armourdale district of Kansas City, Kan. Monthly capacity will be 5,000,000 cu ft; operation is scheduled for December. At that time, Airco's Kansas City, Mo., plant will be closed.



If you use cutting

Big News

How Engineered Oxygen Cutting Can Increase Your Profits

A new concept in cutting machine techniques may revolutionize your thinking on what can be accomplished by oxygen cutting equipment. Messer cutting machines feature a distinctive design and construction.

For Greater Accuracy

Through a completely engineered system of operation, you can now achieve new standards of accuracy in precision workmanship! This means improved production efficiency in many industries where metal-working is involved. Messer machines can SAVE YOU MANY DOLLARS.

Revolutionary Design

Relatively new in the U.S.A., Messer is the acknowledged leader in cutting machine

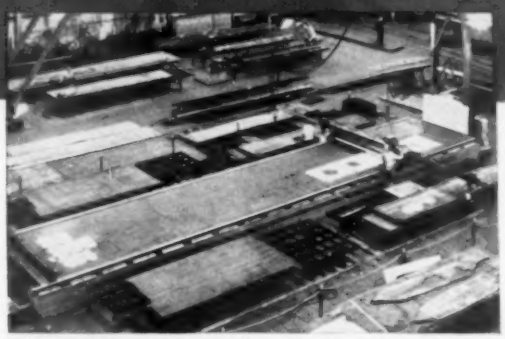
Messer

Messer Cutting

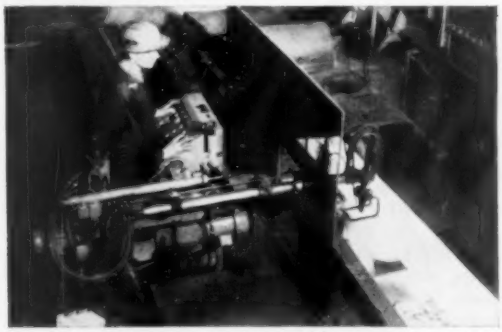
machines, here's For YOU!

design throughout Europe and in other countries. Now in America, Messer cutting machine versatility of design permits greater shop flexibility and the increased use of automation that leads to **greater profits.**

If you use—or could use—oxygen cutting machines—it will pay you to check now on what Messer can offer you. Write for full information. No obligation, of course. **MESSER CUTTING MACHINES, INC., Chrysler Building, 405 Lexington Avenue, New York 17, N. Y.** *Precision Cutting Machines—Oxygen, Nitrogen, Argon Plants.*



Unlimited plate area or complex cutting operations present no problems to Messer equipment.



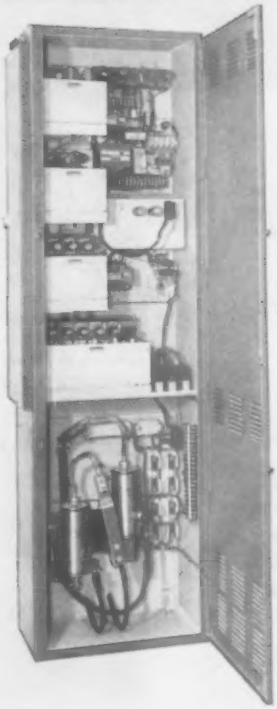
Complete automation is a key feature of Messer cutting machines, as used in this steel mill.

Machines

A. O. Smith developed the exclusive techniques and machines for making non-corrosive "lined" pressure vessels for use in oil refineries, pulp digesters and chemical plants. The non-corrosive liners are spot welded to the inside of the vessel with thousands of welds.

Square D Welder Control proved itself in production by increasing speed, adding to the strength of the welds and reducing repairs

SQUARE D *Electronic* WELDER CONTROL



provided these improvements on one hard-to-weld alloy:

SPEED
Increased 22%!

STRENGTH
Increased 13%!

REPAIRS and REWORKING
Reduced 85%!

What is YOUR Precision Welding Problem?

- *Stainless Steel?*
- *Aluminum?*
- *Magnesium?*
- *Air-Hardenable Steels?*
- *Low-Carbon Steels?*
- *Aluminum-Magnesium Alloys?*

Square D has the control to meet your exact needs. Write us for Bulletin 8993. Address — Square D Company, 4041 N. Richards Street, Milwaukee 12, Wis.

NOW...EC&M PRODUCTS ARE A PART OF THE SQUARE D LINE

SQUARE D COMPANY

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M KELLOGG W

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GD GENERAL DYNAMICS

GENERAL AMERICAN

NJN

CATERPILLAR

WESTINGHOUSE

FRUEHAUF TRAILERS

GarWood

USS

Esso

TODD NEW YORK, U.S.A.

FOSTER WHEELER

BETHLEHEM STEEL

GENERAL ELECTRIC COMPANY

WHY 93 OUT OF 100

leading corporations use Worthington positioning equipment

Worthington welding positioner in Foster Wheeler's Mountaintop, Pennsylvania, plant.

It's a fact. Of the 100 largest industrial corporations listed in the latest Fortune Magazine Directory, 93 are users.

One reason why leading manufacturers have turned to Worthington is good service. With distributors in all principal cities, a Worthington specialist is always nearby to help solve your positioning problems.

Conservative ratings are another. Refusing to compromise with quality, Worthington engineers positioners to deliver, year after year, the rating stamped on the nameplate.

Pick your next positioner from Worthington's complete line. For more information write to Section 55-1, Worthington Corp., Harrison, N. J.

WORTHINGTON

Oxweld
TRADE-MARK

Flux-Coated Bronze Rod SAVES TIME!

THIS triple-purpose OXWELD bronze rod is ideal for braze-welding steel, cast iron, and malleable iron; for building up wearing surfaces; and for fusion-welding brass, bronze, and copper alloys.

Welds made with OXWELD No. 25M rod average 40% stronger and are more ductile than welds made with ordinary bronze rods under similar conditions. Precoated during manufacture, OXWELD No. 25M Flux-Coated Rod automatically introduces into the weld exactly the right amount of flux to insure both thorough cleansing and uninterrupted tinning action. This speeds your work by permitting you to give full attention to deposit of weld metal and control of the molten puddle.

OXWELD No. 25M Flux-Coated Bronze Rod is available in 1/4-, 3/16-, and 1/8-in. diameters from your nearby LINDE Distributor. For further information write LINDE COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y. Offices in other principal cities. *In Canada:* Linde Company, Division of Union Carbide Canada Limited, Toronto.

Linde TRADE-MARK
UNION CARBIDE

The terms "Linde," "Oxweld," and "Union Carbide" are registered trade-marks of Union Carbide Corporation.

Letters . . .

Letters should be addressed to: The Editor, WELDING ENGINEER, P. O. Box 28, Morton Grove, Ill. No letter will be published unless signed, but your name will be withheld if requested.

Welding saves $50,000

Sir: *Baltimore*

In view of your comment about the New York *Times* in "Between Passes" (July, 1958), you might be interested to know that the Baltimore *Sun* newspaper, every bit as old and substantial as the New York *Times*, constructed their new plant built in 1949 as an all welded structural steel frame selected as an alternate to a riveted job.

This welded structure, because continuous moments were used, was better than the original riveted layout. In addition, the welded job saved 332 tons of steel . . . this saved the *Sun* over $50,000 at the then erected prices for structural steel . . .

Incidently, I wish to congratulate you on the July editorial.

Van Rensselaer P. Saxe
Engineer

Mixed emotions

Sir:

Pasco, Wash.

It was with equal emotions of gratification and bitterness that I read in the June issue of *Welding Engineer* the article entitled "Who is a certified weldor?" (p. 70) by W. R. Stevens of the National Certified Pipe Welding Bureau.

The gratification . . . because at long last something is being done to remove the awesome burden of perpetual, repetitive and totally unnecessary testing of weldors when they complete one job and go to another.

Many weldors feel bitterness that progress has been so slow. How many other craftsmen must place their chances of employment in escrow each time they change jobs? If the weldor is guilty of one small error in workmanship while under such an emotional strain, his chances of earning a livelihood on that particular job is immediately forfeited.

I do not wish to be misinterpreted. I am in favor of testing weldors, but the generally accepted system of retesting for each employer clearly indicates the deplorable lack of coordination in the welding industry. Periodic testing only . . . should replace the system of retesting for each new employer.

The time is long past due for the welding industry to coordinate its strength, energy and resources and rise up in indignation against the buffetings of other trades, unions and certain fed-

eral agencies, namely the NLRB, and demand rightful recognition in the metal-working industry. Welding has outgrown the idiotic and archaic notion of President Wilson's war labor board in 1918 that welding is a "tool of the trade" like a hammer, saw or wrench.

What possible alternative is there for an experienced weldor but to feel intense anger and resentment against a ruling that states categorically that his years of experience are a nonentity. After all, how long does it take to learn the intricacies of the use of a hammer, a saw or a wrench?

Your excellent editorials deploring the inadequate use of welding design and welding in many phases of metal fabrication would no longer be necessary if the leaders of the welding industry would assume as their primary goal the recognition of welding as a craft, enjoying the same dignity as any other metal working craft.

The U.S. Navy, to my knowledge, has always been a leader in research, development and utilization of welding. The Navy recognizes welding as a craft among its civilian personnel, and treats it as such. What justification can private industry find for its continued suppression of so important a metal joining process as welding?

The principles of the National Pipe Welding Bureau appear to me to be the preamble of the weldor's emancipation from the bondage of obscurity.

You, Mr. Jefferson, while devout and sincere in your desire for welding to progress, are only lopping off branches when you should be chopping at the roots of our troubles. Let us devote our energies toward the recognition of welding as a classified craft first. I feel certain that then the main hurdle would be complete, and with a small amount of effort our other goals could be realized.

Allen Short

Congratulations

Sir: *Portsmouth, N.H.*

Again we thank you for an even better Fact File, Mid-June edition. We like the lead article "The meaning of weldability" . . .

A similar informative article on the welding of dissimilar metals would be most helpful. We get many questions on overlays on, or joining different metals. There should be some general rules from basic facts. For example, I have always tried to avoid too much copper and chromium together, but am not sure just how much of these elements can cause how much trouble . . .

The discussion of procedures we had at St. Louis during and after your panel's discussion of "Practical shop operations" is bearing some fruit—we hope. The foreman welder at Portsmouth and I are assembling material and slides on "Practical welding procedures." We expect to have a paper ready for Chicago in April. We have some good examples that have produced good results.

Again, congratulations and thanks,

S. I. Roberts
Welding Engineer

Welding prominence

Sir: *Vancouver, B. C.*

We of the B. C. Welders Association wish to have welding established as a trade on a national basis and are presently gathering information as to why it should be established as such.

Knowing of your fine work, and vast experience in the welding industry we feel you men are most qualified to assist us in supplying such information.

We would appreciate it very much if you could find time to help us in our endeavor.

H. F. Fowler

Early patents

Sir: *Pittsburgh*

In your August, 1958, article in the WELDING ENGINEER ("The fundamentals of welding engineering," p. 41), reference is made to the submerged-arc welding process patents issued in the year 1933.

National Tube Div. originally developed the submerged-arc welding process and . . . a patent was issued on Nov. 18, 1936, to B. S. Rubinoff, S. E. Paine and W. E. Quillen. It was U. S. Patent 1,782,316.

In 1930 a pipe mill was constructed at McKeesport, Pa., by National using the submerged-arc welding process. Forty ft lengths of 14 by 30 in. OD and 30 ft lengths of 24 by 72 in. OD pipe were produced. The capacity of the mill was four miles of pipe per day. Automatic 600 amp, 32 volt welding machines with 3/16 in. bare wire electrodes were used. After welding, the pipe was sized in a press.

This process was later applied to the longitudinal weld on the inside and outside diameter of large diameter linepipe by Western Pipe & Steel Co., which today is part of the Consolidated Western Steel Div. of the United States Steel Corp. In 1949 Consolidated Western Steel Div. was granted a patent for the tandem electrode which is now used in the production of large diameter linepipe by the submerged-arc welding process. This patent, No. 2,489,000 was issued to C. A. Babbitt on Nov. 22, 1949.

Arthur Wilder
Chief Metallurgist

Your

LINDE Distributor

has it—

1. Service

Every authorized LINDE Distributor is an independent *local* businessman who knows your welding and cutting needs, has them ready for you, and satisfies you promptly.

2. Know-How

LINDE Distributors are welding supply *specialists*. Their technical background, practical experience, and knowledge of local industry can help you with your welding and cutting problems.

3. Superior Products

Your LINDE Distributor carries a *complete* line of industrial gases, equipment and supplies for your welding and cutting requirements. He handles only high-quality products of proved efficiency and best suited to your individual needs.

A telephone call to your nearby LINDE Distributor will bring you the benefits of more than 50 years of LINDE COMPANY's pioneering and leadership in welding and cutting. If you don't know your local LINDE Distributor, look in your classified telephone directory. Or write for further information to LINDE COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N.Y. *In Canada:* Linde Company, Division of Union Carbide Canada Limited, Toronto.

Linde UNION CARBIDE

The terms "Linde" and "Union Carbide" are registered trade-marks of Union Carbide Corporation.

Welding Wire: Cost-saving

• Production men who are conscious of *both cost and quality* agree that a top-grade weld demands the *right* welding wire. *Only* by using wire with an analysis suited to the material to be welded can consistently sound welds—free from porosity and internal cracks—be produced. Use of the right wire means fewer rejects, less waste, lower costs—plus better performance of the finished part or product.

Experienced welding men have long found PAGE a most reliable source of welding wire for all their regular and special needs. The wide range of PAGE analyses—33 of them—makes it possible to select the exact wire that produces the kind of welds that lower production costs and increase profits.

PAGE experience, talents and facilities are available to you at all times. We have been exclusive wiremaking specialists for more than half a century, and are in an ideal position to furnish our customers with the right wire for each specific need. Furthermore, we have developed a broad packaging program which saves our customers time and money by supplying wire packaged to meet any requirement.

These factors, plus PAGE'S nationwide set-up of conveniently-located distributors, backed up by nearby PAGE warehouse stocks, help make it economical and profitable for you to standardize on PAGE Welding Wire.

PAGE offers—
33 ANALYSES
...the right analysis for your welding job

There are *33 different analyses* in the PAGE line, covering the broadest range of applications: submerged arc...inert gas...tungsten or metal arc...oxy-acetylene gas welding...metal spraying.

For example—

ANALYSIS A-S-65...Here is a reasonably priced hard facing material which, with inert gas or a neutral flux, will deposit a machinable overlay ranging from B-95 to B-99 Rockwell Scale Hardness. This overlay work hardens under impact up to C-10 Rockwell and has unusually high resistance to abrasion or erosion.

It is also much used for build-up where a high-priced final layer of hard facing material in the range of Rockwell C-35 to C-45 is required, as the durable yet elastic build-up of A-S-65 cushions the shock of impact on the very hard surface layer and prevents spalling and cracking. A-S-65 is also extensively used with oxy-acetylene welding, producing the same results as given above for inert gas or submerged arc welding—a very versatile member of the PAGE Line of Welding Materials.

For example—

ANALYSIS A-S-ARMCO IRON...For many years, "Swedish Iron" has been renowned for its purity and dependability. However, in the United States, Armco Corporation has been steadily producing its "Armco Iron" with a guaranteed total quantity of other elements of less than .10%.

This pure iron is used by high-quality producers who must know within fine limits just what analysis they start with.

For very limited analysis ranges, where alloying elements are to be added, either through the flux (submerged arc) or through the coating (shielded arc manual welding), the particular user insists on A-S-Armco Iron Filler Metal—obtainable only from PAGE.

NOTE: previous advertisements in this publication have included brief descriptions of PAGE Analyses A-S-8620, A-S-6150, A-S-30 and A-S-NAX-9115. Detailed information on all 33 PAGE analyses is contained in our Welding Wire **Comparison Chart DH-1218.**

Write for—Welding Wire **Comparison Chart DH-1218** (*shown above*). This highly informative four-page chart lists detailed analyses of PAGE automatic welding wires, metal spray wires, bare electrodes and gas welding rods. Also shows uses and physical properties, including: tensile strength, elongation, Rockwell hardness. Chart lists virtually all competitive makes.

Write for—Submerged arc and inert gas welding wire **Folder DH-402A**...also gas welding rod **Booklet DH-1277.**

This message is for men who are vitally concerned with such welding problems as maintaining a smooth flow of production... preventing excessive rejects...and insuring trouble-free, economical, profitable operation.

and Profit Factors

PAGE offers— Packaging to meet your needs

PAGE Welding Wires are packaged in a wide variety of ways—for the most complete protection and the utmost convenience in handling, in stocking and in use. Here are some major types of PAGE packaging:

1. Paper Wrapped Coils 2. Coils in Cartons, Palletized
3. Bare Coils (packed in Leverpaks)
4. Masonite Reels 5. Payoffpaks 6. Payoffpallets
7. Gas Rods in Burlap-wrapped Bundles
8. Stainless Gas Rods in 10-lb. Tubes

For example— PAYOFFPAKS

Up to 700 lbs. of wire, without a single weld...coiled around a fiberboard cylinder within a fiberboard drum ...ready to be smoothly unreeled to the welding head for automatic or semi-automatic welding! Eliminates costly machine down-time for coil replacement. Payoffpaks come in three sizes: 20" diameter (holds 250 or 500 lbs.); 23" diameter (holds up to 700 lbs.).

Wrapped Coils—Coils in Cartons | Welding Wire in Coils | Handy Reels | Gas Rod Packing | Payoffpaks and Leverpaks | Payoffpallets

This Chart Shows How PAGE Offers The Exact Packaging You Want

PACKAGING ↓ / PAGE WIRE for →	Gas-shielded consumable electrodes: Automatic Welding	Gas-shielded consumable electrodes: Semi-Automatic Welding	Filler wire for automatic or manual Inert Gas Welding	Submerged Arc Welding	Straight and cut lengths Bare wire: Manual Electric Welding	Straight and cut lengths Bare wire: Oxy-acetylene Welding
25-lb. or 60-lb. coils wrapped in waterproof paper, steel-strapped, single or palletized.	✔	✔	✔	✔		
25-lb. or 60-lb. coils in individual cartons, single or palletized.	✔	✔	✔	✔		
120 or 180 lb. (22"/24" I.D.) coils, paper-and-burlap wrapped, or in cartons, palletized.	✔			✔		
Special coil sizes (on application).	✔	✔	✔	✔		
25-lb. reels (spools) in carton to fit all standard machines; single or palletized.	✔	✔	✔	✔		
Leverpaks, 15" dia., 25-lb. coils (12" I.D. x2½" wide); Leverpaks, 17" dia. 50/60-lb. coils (12" I.D. x4" wide).	✔	✔	✔	✔		
Payoffpaks: 20" dia. size holds up to 500 lbs., 23" dia. size holds up to 700 lbs.	✔	✔		✔		
Payoffpallets, holding 900-1200 lbs. of wire (1/16" to 1/8" sizes, incl.) coiled around pedestal on a wooden pallet.				✔		
Paper-and-burlap wrapped bundles, containing 50 lbs. of rods in 36" lengths.			✔			✔
Fibreboard cartons, containing 10 lbs. of rods in 36" lengths; single or boxed. 50¢ and over.			✔			✔
Burlap-wrapped 50-lb. bundles of bare wire electrodes in 14" and 18" lengths.			✔		✔	

***Write for*—PAGE Welding Wire Packaging Chart**
This useful chart shows the many kinds of packaging of PAGE Welding Wires for each type of welding.

Now—about Delivery... PAGE offers— Availability from local stocks

• Here is a handy service that not only gets you the welding wire you need when you need it, but saves you money by making it unnecessary for you to tie up a sizeable investment in wire inventory.

You can get the exact PAGE automatic welding wire and welding rods your job requires direct from your nearby PAGE Distributor. Located at many points from coast to coast, PAGE distributors carry sizeable stocks for your convenience—and they are backed up by PAGE Warehouses at the strategic locations shown below. Close cooperation between PAGE distributors, PAGE warehouses and the PAGE mill is your guarantee of prompt, intelligent, individual service on your specific needs.

ACCO

Page Steel and Wire Division
AMERICAN CHAIN & CABLE

Monessen, Pa.*, Atlanta, Chicago*, Denver*, Detroit, Houston*
Los Angeles*, New York, Philadelphia*, Portland, Ore.
San Francisco*, Bridgeport, Conn.

*Indicates PAGE warehouse stocks

ACCO for Better Values

4 in 1

3 in 1

2 in 1

WELDERS/ POWER PLANTS

Hercules (Lycoming design) air cooled engine

FIREBALL AMPERAGE RANGES

Tungsten Inert Gas		Metallic Arc	
DC	AC	DC	AC
35-100	35- 75	35- 80	35-100
85-225	65-160	75-175	65-160
170-375	150-375	125-350	110-400

DAH-350 FIREBALL four-in-one model is the only complete unit made to incorporate an ac-dc welder for (1) metallic arc, or (2) tungsten inert gas welding, plus (3) ac power plant, and (4) 1 KW dc power while welding. Twelve separate amperage ranges as shown above. Additional standard equipment features include a polarity switch, either continuous or "start only" high frequency and an automatic inert gas control panel with solenoid valve and postflow timer. Rated output at 100% duty cycle: 250 amps dc tungsten arc; 300 amps ac tungsten arc. Generator: 10 KW of 115/230v, single phase, 60 cycle ac.

DA-300 BIG RIG. Combination ac-dc welder, plus an ac power plant, plus 1 KW of dc power while welding, give this model three-in-one versatility. Generator rated at 10 KW of 115/230v, single phase, 60 cycle ac. Welding ranges in amperes are: (dc) 75-175 or 125-350; (ac) 65-160 or 110-400. Rated output at 100% duty cycle: 250 amps dc at 40 volts and 300 amps ac at 40 volts.

D-250 ROUSTABOUT provides a two-in-one arrangement whereby either of two dc welding current ranges — 75-175 amps or 125-350 amps — and 1 KW of 115v dc auxiliary power are available simultaneously. Rated output is 250 amps at 40 volts, 100% duty cycle. Generator produces 10 KW of 115/230v, single phase, 60 cycle ac.

All models offered with skids or trailers. Complete specifications and prices sent promptly.

miller Electric Manufacturing Company, Inc. APPLETON, WISCONSIN

EXPORT OFFICE 250 East 57th St. New York 19, N.Y. • Distributed in Canada by Canadian Liquid Air Co., Ltd., Montreal

BETWEEN PASSES

anything finer?

'Twas no exaggeration when we entitled an April article "Welded yawl cops cups." For the *Dyna*, an aluminum yawl whose fabrication was described in that piece, has gone on to greater fame—adding two more cups to her owner's trophy case. The sleek 57-ft craft took top honors in both the Port Huron-to-Mackinac Island and the Chicago-to-Mackinac races.

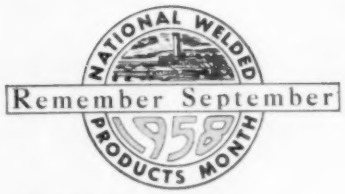
nuclear abc's

The Babcock & Wilcox Co., New York City, will train the licensed engineering officers of the *NS Savannah*, the world's first nuclear-powered merchant ship. The program will provide instruction in reactor theory as well as in engineering and operation of the ship's reactor now under construction by B&W. States Marine Lines previously had been chosen as general operating agent for the *Savannah*. The welded nuclear-powered vessel is being built by New York Shipbuilding Corp., Camden, N. J.

translations, nyet?

The U. S. Department of Commerce has organized a Foreign Technical Information Center to provide translations of Soviet technical data. Services of the new office will include publication of abstracts of all articles appearing in 141 Soviet technical journals, translations of important sections of *Referativnvy Zhurnal* (the Russians' own abstract journal), and a semimonthly review of various areas of Soviet science compiled by the Central Intelligence Agency. Abstracts of each issue of the 141 journals may be purchased on a subscription or single-issue basis, as may the CIA's *Scientific Information Report*. The abstract journal will be sold only in single issues at present, but subscription sales may be offered later.

The Center is part of the Office of Technical Services, Business and Defense Services Administration.



daddy of 'em all

Would a tunnel across the English Channel be economically feasible? That question was first asked back in 1802, and it is being asked again. (The answer is more likely to be *yes*, now that welding is in the picture). Studies now being made are sponsored by a group composed of representatives of the Suez Canal Company, the French and British Channel Tunnel Cos., the International Road Federation (Paris office), and Technical Studies, Inc., of New York City. Among the decisions to be made: will the tunnel carry only railway trains, or automobiles as well? The answer hangs largely on development of a satisfactory ventilating system. While the Channel is only 22 miles across at its narrowest point, the proposed tunnel would probably be about 40 miles long, in order to have its openings far enough inland.

If the tunnel is ever built, it will be another example of the importance of welding. *Have you remembered September?*

take a bow

Only last month, this page reported on progress the Canadian Welding Bureau has been able to achieve because of farsighted planning (especially as respecting codes). Now we see that the Bureau has instituted another program which might well be imitated. It recently sponsored a practical welding course at Ryerson Institute of Technology for about 30 building officials and inspectors from the metropolitan Toronto area. Eight sessions were conducted. Purpose of this training was not to make qualified weldors of the men (not in that short time), but to "better acquaint inspectors with practical problems of welding so they might more intelligently seek out defects and be better able to assess the degree of deficiency involved." Understanding welding's limitations was secondary, however, to establishing confidence in its practice.

Next summer, when school facilities will again be available, the Bureau hopes to conduct a similar course for architects, consulting engineers and other professionals.

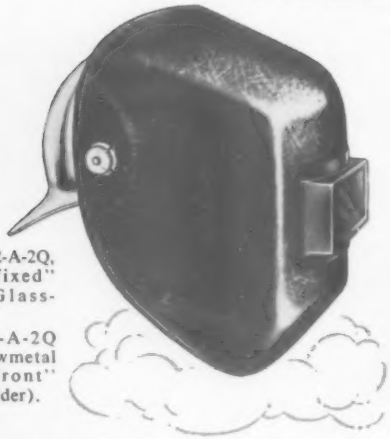
in this issue . . .

Beginning on page 29 is a special six-page feature on welded products to help commemorate this, the first annual National Welded Products Month. On pages 36-37, you will find a pictorial review of welded products seen by visitors to the Brussels World Fair. Some additional facts on the "Atomium" shown on page 37: its actual size is a 165-billion-time magnification of the nine-atom cell it depicts; more than 2,000 radiographs (X-ray and gamma ray) of welds were made before the structure was approved for service (according to Gevaert Co. of America); it is a symbol of nuclear energy, the key to our future.

Nuclear energy, incidentally, will be the topic of an article in *WE* next month. Don't miss it!

"Everywhere I go . . . everywhere I look! It's driving me nuts."

How to be **LIGHT-HEADED** *... but sane,* **SAFE** *and* **SOUND!**



No. 4672-A-2Q, with "fixed" steel Glass-holder. (#4676-A-2Q has Dowmetal "lift-front" Glassholder).

LIGHTEST SAFETY BUY

this FIBRE-METAL *combination is lighter by...* **7** *ounces*

with QUICK-LOK

(Helmet also sold *separately* with exclusive F-M Headgear and with steel or plastic "fixed", or plastic or Dowmetal "lift-front" Glassholders.)

NEW #4672
"Combination"

WELDING HELMET SHELL

3 OZ. LIGHTER

with QUICK-LOK

(*SuperLite* Cap has exclusive Polyethylene Suspension. Also sold *separately*, as #A-2.)

NEW #A-2Q
"SuperLite"®

ALUMINUM SAFETY CAP

4 OZ. LIGHTER

weighs much less than any other helmet-safety cap combo!

HERE IS *THE* pair to pick ... either as a combination or as separates! The NEW #4672 Weld Helmet "shell" is of Fiberglas-reinforced polyester resin ... *narrow*, for close-quarter work and *deep* for full protection! It's self-extinguishing, non-warping. *And 3 ounces lighter than any standard helmet!* • Fitted with *QUICK-LOK* Attachment to the extremely light *SuperLite* Aluminum Safety Cap, the "combination" is incomparably air-light ... for easy, all-day comfort. • *Famous Features:* C-1 Polyethylene Suspension, girder-ribbed cap safety design, quick and positive connect-disconnect. • ***Ask your Welding & Safety Supply Distributor for Fibre-Metal's "light combination" TODAY!***

No. 676-3-C has #1096 Dowmetal "lift-front" Glassholder.

Famous #4-C Headgear has ratchet head-size adjustment, is free-floating.

Sold everywhere! ***Form "T" describes it.*** ***Just ask!***

THE FIBRE-METAL PRODUCTS COMPANY

CHESTER, PENNSYLVANIA • ***In Canada: Fibre-Metal (Canada) Limited, Toronto***

VISIT US AT The NATIONAL SAFETY SHOW, CHICAGO—Booth 179-180

This cracked iron housing begged for retirement

But it was hard for the company to comply when they found a new pump housing would cost $1800, would take 90 days for delivery, and would lay off 40 men during the shutdown.

So they sent it over to Lawton-Schrader, a welding company in Richmond, Virginia to see if it could be repaired. Their weldors said it could be *permanently* repaired with Ni-Rod* "55" Electrodes. And they did it. All it took was 8 hours, 5 passes, and 23 pounds of Ni-Rod "55" Electrodes which also eliminated the need for preheat and postheat.

Back on the job in 1½ days, this pump housing is expected to last till the pump wears out. And the total cost came to $384, a saving of over $1400.

Good to keep in mind and on hand

The example above brings out two good points. One . . . it's a good idea to keep Ni-Rod "55" in mind for emergency repair of cast iron parts. Two . . . it's even a better idea to keep a supply on hand to meet these emergencies when they come up.

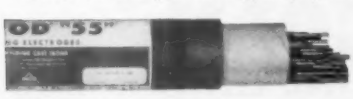
Ni-Rod "55" makes permanent repairs possible with a minimum of time lost, and with a minimum of effort and money spent. It offers you a practical way to salvage defective castings and to join cast irons to other metals. It's ideal for building up worn or undersized areas. Machinable Ni-Rod "55" deposits give service as good or better than the original metal. And in 9 out of 10 cases, no preheat or postheat is needed.

Booklet gives complete data

"Repair Cast Iron Parts Quickly and Easily" tells the Ni-Rod "55" story in detail. It's yours for the asking. Write:

*Registered trademark

The International Nickel Company, Inc.
67 Wall Street INCO New York 5, N.Y.



INCO WELDING PRODUCTS
ELECTRODES • WIRES • FLUXES

Weldynamics

ARC WELDING AT WORK CUTTING COSTS

WHY WELDORS AND MANAGEMENT LIKE IMPROVED FLEETWELD 47

Improved Fleetweld 47 gives that fast, easy operation . . . yet it isn't limited to the flat position.

Weldors appreciate the smooth flowing action!

Management loves the cost-cutting speed and versatility.

Try Improved Fleetweld 47 on your next flat and uphill production job. You'll love it too! It conforms to AWS E-6013 and E-6014.

Write for the *new* Weldirectory Bulletin 7000.1.

Lincoln men who know Weldynamics will help you establish procedures, select equipment and electrodes for most efficient, low-cost welding.

The World's Largest Manufacturer of Arc Welding Equipment

LINCOLN

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THE LINCOLN ELECTRIC COMPANY, DEPT. 1745, CLEVELAND, OHIO

SEPTEMBER, 1958

Welding Engineer

ESTABLISHED 1916

NATIONAL WELDED PRODUCTS MONTH

Remember September 1958

THE TIME is *now* for the welding industry's first National Welded Products Month.

This September, 1958, didn't arrive in a blaze of glory—but it's more than a flash in the pan. There are thousands of persons throughout the world who know more about welding now than they did a year ago. That's satisfaction enough for this initial effort.

But what about September, 1959? That, too, will be National Welded Products Month, for this observance will be an annual affair from now on. We are already making plans for it; so are all those WELDING ENGINEER readers who helped us publicize welding in 1958.

A number of men in this small army of welding boosters have given us some views on the work they did for National Welded Products Month. They enjoyed it—enjoyed putting into words their strong pro-welding feelings, and awakening an interest in others.

WHAT DID their efforts cost them? *Not a dime.* But there will be more than dimes involved when the fruits of their labor in public education are harvested. The crop will be reckoned in millions of dollars.

Obviously, "Remember September" advocates varied their approach. To engineers, they could speak of metal characteristics, power requirements for welding, and production costs.

To those unacquainted with welding—well, they spoke of items like those pictured in our special Welded Products section in this issue. Automobiles, trains, boats, office furniture, trucks, musical instruments, kitchen appliances—all outstanding advertisements for welding's strength and appearance. And these are but a few of the thousands of products now made better, cheaper and faster through welding.

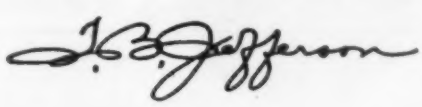
THERE ARE additional thousands of products which could benefit by a switch from other joining methods to welding. But there won't be any benefit . . . there won't be any switch . . . unless *you* help bring it about.

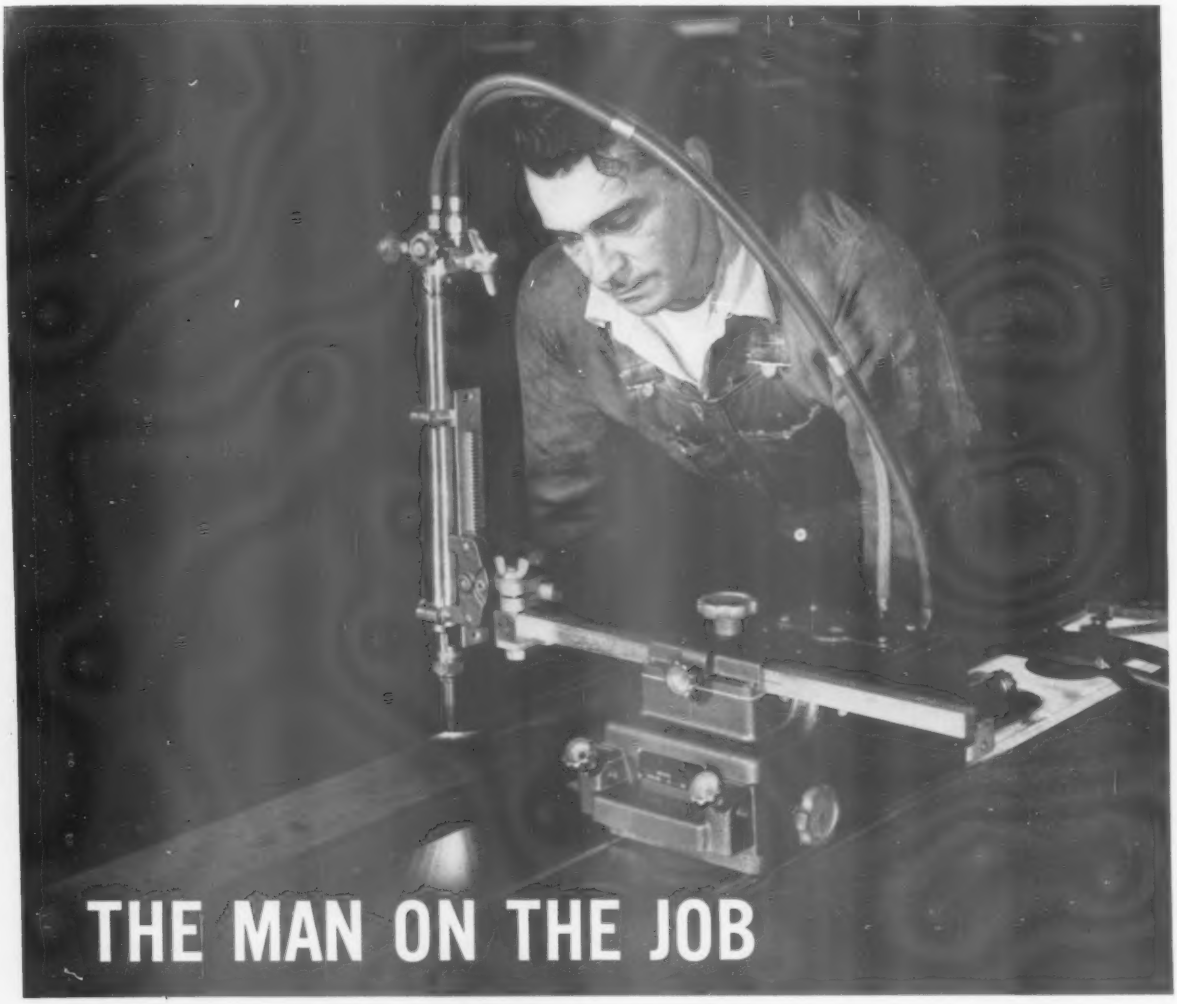
You are a welding salesman—no matter if you're a weldor out on the line, an engineer, a designer, or an advertising copywriter. You personally believe in the bright future of welding and you have the power to convince others that welding is one of the most important elements contributing to the comfort and efficiency of their everyday lives.

The country is still in the throes of a recession. We don't know how long it will continue, or just what it will take to put all U.S. industry back on a prosperity footing. But we do know that it's going to take more than desire alone to effect a resumption of normal business activity.

It's going to require, for instance, your participation in such worth-while efforts as National Welded Products Month. And it's going to take patience: an enthusiastic word today won't work miracles tomorrow.

But when all of us pull together for welding, a change for the better is assuredly in the making.





likes Victor Machine Torches and Tips

AND SO WILL YOU, because you get travel speeds from 0 to 180" per minute, forward or reverse, with Victor's Model VU-120 portable flame-cutting machine. It cuts straight lines, circles, square or bevel kerfs with remarkable accuracy. Wide speed range enables you to adapt travel carriage to many automatic welding applications, using either submerged or inert arc.

HERE IT'S SHOWN cutting with a **new** LPCG machine cutting torch and tip — one of a **new** series designed to give maximum efficiency with natural and propane preheat gases. Remember, Victor torches perform best when you use genuine Victor tips.

For the torches and tips that cut your costs, call your Victor dealer.

VICTOR for welding

VICTOR EQUIPMENT COMPANY

Mfrs. of welding & cutting equipment; high pressure and large volume gas regulators; hardfacing rods, blasting nozzles; cobalt & tungsten castings; straightline and shape cutting machines.

49

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J. C. Menzies & Co., Wholly-Owned Subsidiary

Welding
Engineer
Presents

National Welded Products Month

WELDING in every way . . . Welding at home . . . Welding at play . . . Welding at work . . . And on the way. Such is the theme of the next five pages.

Such, indeed, is the theme of welding itself. For there is scarcely an occupation or recreation that is not served in some way by welding. The farmer plows wheatland with a hardfaced plow. Welded combines reap the grain. Welded trucks haul it to market. By the time the wheat has been transformed into bread and reached your table, it has probably gone through hundreds of operations which depend upon welding in one way or another.

Yes, the flare of the torch and the crack of the arc are seen and heard throughout the land.

But just what is welding? One dictionary defines "weld" as "To unite closely or intimately; join so as to form a single or integrated whole."

Welding is far more than this! It is an industry offering a livelihood for more than a million people: engineers, weldors, fabricators, salesmen, distributors, and manufacturers.

It is an industry worth billions of dollars a year, putting muscle into the nation's economy, creating a higher standard of living. It is a builder. A doer. A giant. Without it, we would pay more for less efficient products.

This is National Welded Products Month—a humble, sincere tribute to the men and machines who have made welding what it is today.

WELDING: IN EVERY WAY

IT IS THE WORLD'S most famous silent partner. Everything useful and enjoyable in daily life has in one way or another been affected by it. It is everywhere. It is welding.

Welding is in the home, on the seas, in the factory, on the farm—even in the stratosphere. From dental plates and braces to missiles and rockets, it has silently and efficiently provided better appearance, design and service for the American consumer.

Conceived in the mind of man centuries ago, and born of a need for better strength and economy, welding grows stronger every day. Its heritage is utility—its future is unlimited.

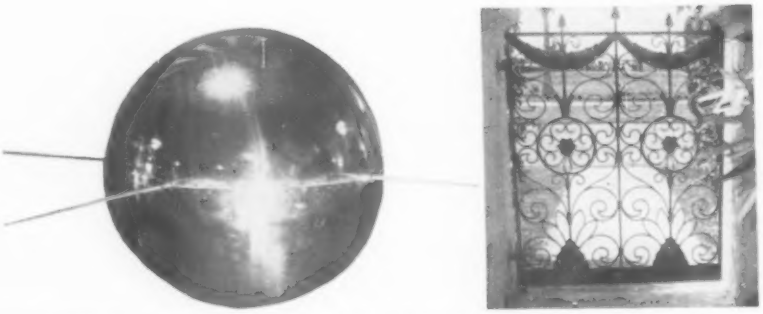
It is a partner with the giant earth-movers paving the way for other partners, the automobile and train. While overhead, welding flies with the airliners and surveys the long columns of friends it has made.

Generals and scientists depend on it to place their satellites into outer space. Physicists need welding's help in building their nuclear reactors. Manufacturers have designed their products to include it—since there is no better way of fabrication.

Homes and buildings, tables, chairs and cabinets, washers and dryers, typewriters, computers and fountain pens—these are its partners. Clocks and jewelry, safes and derricks, stoves, refrigerators and even the welding machines themselves—all depend on welding in one way or another.

Welding supports Texas Towers when hurricanes strike. It keeps air out of light bulbs and keeps water inside storage tanks. It helps produce the notes of a trumpet, the good smell of coffee and the food on the table. It helps provide the joy of a bike ride, the convenience of automatic bowling machines and a baby's laughter at a toy.

Welding is everywhere—it is your silent partner.

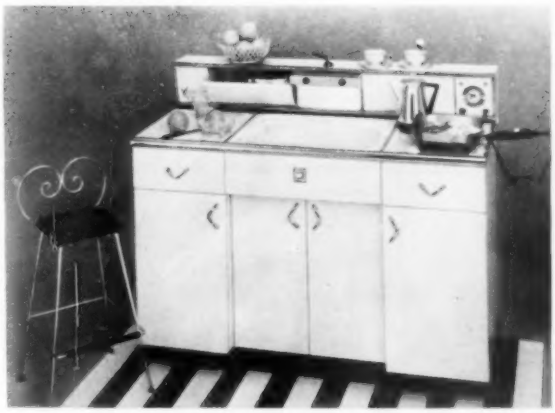


AROUND the world in 90 minutes, or through the gate in 90 seconds—both rely on welding. The satellite above contains an inner ring and an internal framework to carry electronic equipment. Both are Tig welded. Iron gates require deep penetration since the welds are ground flush before painting. Arc welding with 1/8-in. electrodes on light parts and 3/16-in. electrodes on heavier parts eliminates warpage and the need for unsightly braces.

CONSTRUCTION of all kinds depends greatly on welding's economy, strength and weight-savings. The U. S. Steel Corp.'s prefabricated house has a 4 by 8-ft resistance welded panel as its basic component. Wall framing and interior partition units and window frames are spot welded.

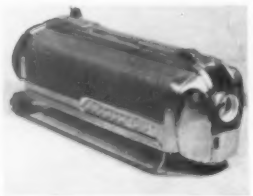
LANDING craft retrievers built by R. G. LeTourneau, Inc., for the Army Transportation Corps are completely welded. Since welding is about the only practical means of fabrication, these monstrous machines are all of welded design. The semiautomatic submerged-arc process is primarily used.

LINERS and doors for the Norge refrigerator have always been resistance welded. Model change-over time has been cut as much as 80% with a new automated welding line.



KITCHEN and undersink cabinets made by Youngstown Kitchens have always been resistance welded and no other means of joining has ever been considered. Chair and appliances shown are also of welded design.

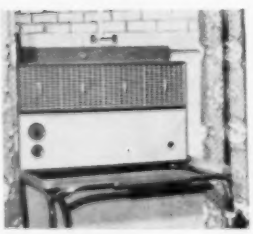
WELDING: AT HOME



SEAM and spot welding replaced soldering in 1937 in fabrication of Electrolux Corp.'s vacuum cleaner, solving an airtightness problem.

BEGINNING in 1929, Westinghouse Electric Corp.'s appliances have made use of all resistance welding processes, arc and Tig welding, and furnace and machine brazing. Most products, such as the oven above, can only be fabricated by welding. Mixers and steam irons (above left and below) make use of resistance, gas and arc welding in that order, saving an estimated 50% in cost over other joining methods. Air conditioners (below) have 125 resistance welds, 80 silver alloy braze joints, 30 in. of arc welding, 6 furnace brazed joints and 3 ft of soft soldering.

WASHERS and dryers by Maytag Co. have always been welded since the company believes no other joining method would be acceptable. Resistance welding accounts for about 90-95% of fabrication; the rest is done by arc welding.

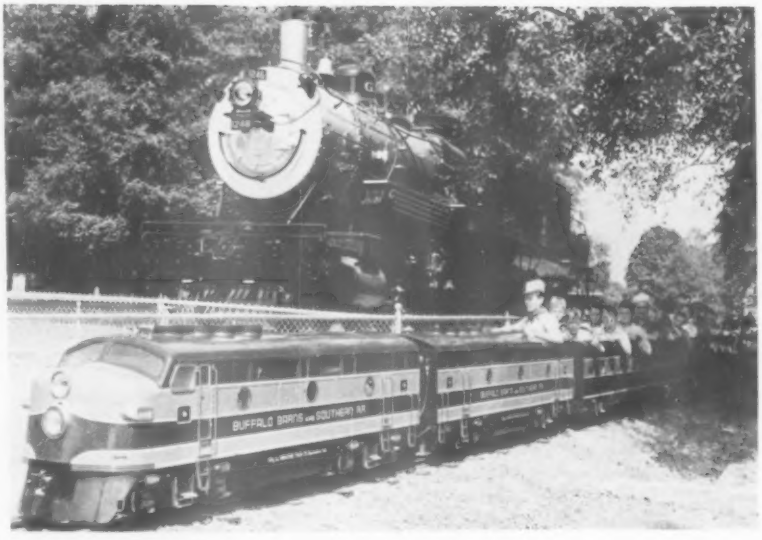


WELDING: AT PLAY . . . . . .

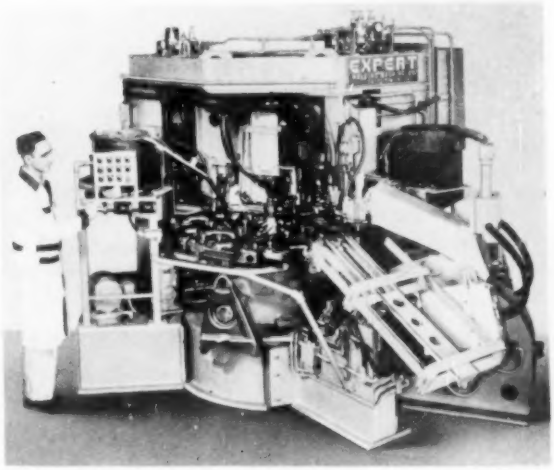
IF you were asked to name America's most popular sport—don't guess baseball, you'd be wrong! Our favorite sport, according to American Machine & Foundry Co., New York City, is bowling. More than 20 million of our citizens feel at home on the alleys, says the company. And one reason for such increasing popularity is this automatic pinspotter. First conceived in 1937, the machine sweeps up tumbled pins; replaces still-standing pins in their original positions, returns the ball, and can even signal the bowler what pins are still erect and whether he has fouled-out. Much of its success is due to welding.

NOT all recreation is confined to solid ground as can be seen in this photograph of an aluminum runabout and its passengers skimming over the surface of a quiet, northwoods lake. Boats like this Arkansas Traveler have been Tig welded by the Southwest Mfg. Co., Little Rock, since 1947. A survey made several years ago indicated to the firm that welding cuts its joining costs $0.10 per ft over riveting. A real saving for the company and for would-be sailors.

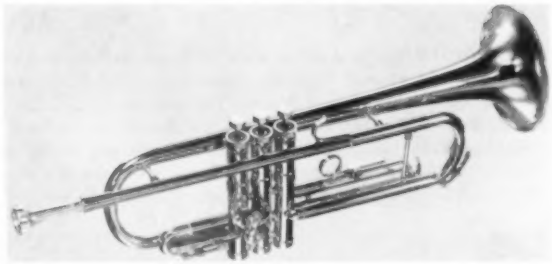
MINIATURIZATION is booming, trumpets a recent advertisement. And the statement seems to be proved when we compare this amusement park train with the full-blown steam engine in the background. The child's version, built by Miniature Train Co. Div. of Allan Herschell Co., Inc., N. Tonawanda, N. Y., is a 1/8 scale of a GM diesel featured elsewhere on these pages. Welding has been considered indispensable to its fabrication for the past 30 years at which time it replaced rivets, threaded pipe fittings and bolts. Tig and resistance welding are extensively used because many of the train's parts are aluminum. Supporting these workhorses are gas and metal-arc welding. A company official recently told WELDING ENGINEER that welding saves about 30% over other assembly methods.



EARTH-moving equipment and tractors, such as the one on the left by Caterpillar Tractor Co., use a large amount of welding in fabrication, from the C-frame hoisting the shovel, to the engine covering. Cost and weight-savings dictate welded design.



EVEN the resistance welders themselves are fabricated by welding. Only one or two of the above Expert Corp. welders have been built, but they were designed for welded construction—the most practical and economical method.



BAND instruments by C. G. Conn Ltd. are constructed by brazing all lap and butt seams and silver soldering all straight tubular assemblies. Brazing has always been used on the tapered tube sections, since it is the only practical method.

WELDING: AT WORK . . . . . .

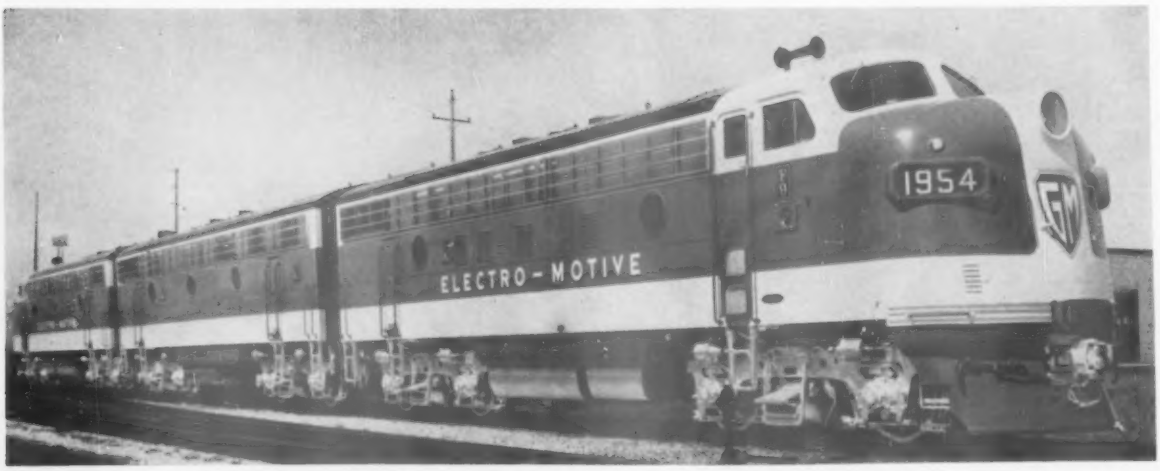
OFFICE furniture of lighter gage materials has always been primarily resistance welded. Strength, rigidity and production speed, as well as irregularity-free surfaces, are the main advantages. Typewriters, files, chairs, desks and even fountain pens are welded.

SPIRAL scroll cases for hydraulic turbines manufactured by Allis-Chalmers Mfg. Co., make extensive use of welding. Cost savings on the cases totaled 25% with a 30% weight-savings. Total cost savings was 9% with a weight savings of 5%.

LUXURY, quality and strength are built-in characteristics of this unitized-body Lincoln. Weldors make slightly less than 10,000 spot welds on every car that rolls off the assembly line. These welds insure a quiet, comfortable ride for passengers.

LEFT: Here it is, the most recent mode of transportation—the helicopter. Sikorsky Aircraft, Stratford, Conn., says it has always used welding: gas, arc, flash and brazing. This is its newly introduced model, the S-62. BELOW: Aptly termed the "Boxcars of the Road," trucks have long been welded. This one was resistance welded by Fruehauf Trailer Co., Detroit, who banished rivets in the 40's when they found welding could save them approximately 15% per unit.

. . . . AND ON THE WAY



THE train that "knew it could" because of welding . . . is fabricated by Electro-Motive Div. of GM in its La Grange, Ill., shops. The firm has used welding since 1924—chiefly metal-arc—because the method saves them from 50% to 100% over other joining methods.

This firm is . . .

On target

. . . with 2 speedy welding methods

Mig, Tig operations used to produce 1,000-lb bombs for Navy pilot training.

by **Raymond L. Downing**

PRACTICE BOMBS, and plenty of them, are needed to sharpen the eyes of U. S. Navy pilots.

As a result, Pastushin Aviation Corp., Los Angeles, Calif., a pioneer in manufacturing jettisonable aircraft fuel tanks, carried its production know-how a step further and started to produce 1,000-lb bombs.

Brunt of the production load was placed on two welding processes: Mig (metal inert-gas) and Tig (tungsten inert-gas) welding and Tig spot welding. Incorporated into nine mechanized and five manual welding stations, this equipment (furnished by Linde Co.) provides the speed, economy and flexibility needed to fabricate a streamlined product at lowest cost.

The 14-in.-diameter bombs are made from 16-gage, cold-rolled 1020 sheet steel. Conical sections for the nose and tail cones are joined at a speed of 50 in. per minute with a mechanized Tig torch equipped with a cold-wire feed unit.

Flanges for the filler caps are welded in place with a Mig welding machine. The torch is mounted on a crank-driven arm. Each circular joint is completed in only 60 seconds.

Nose caps are Mig welded to the end cones in just 27 seconds, and fins are joined in 40 seconds. These sections are then joined to the main assembly with a Tig spot welding gun. Unlike resistance spot welds, the high-quality Tig spot welds are made at top speed without requiring access to both sides of the joint—an impossibility on this job.

After girth joints are Mig welded, the bombs are painted and shipped to the Navy. The argon-shielded processes produce good welds fast, and eliminate the need for finishing operations: advantages that cut production costs to a minimum.

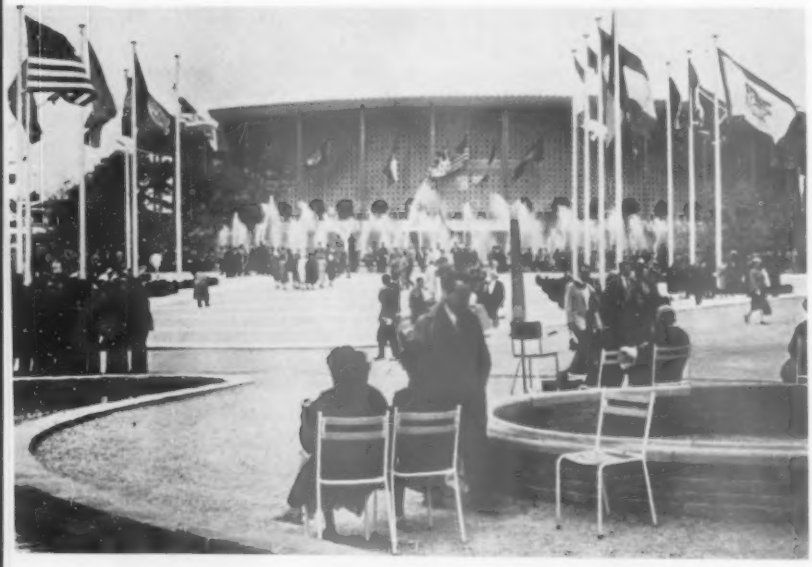
FLANGES for filler caps are Mig welded to nose and tail cones. Then, while a fixture turns the assembly under a stationary torch, as shown above, a nose cap is Mig welded to a nose cone in 27 seconds. Hand switch controls welding.

saldatura . . .

Welding, too, is on display

at the Brussels

Unique artistic and structural designs, most of which could not have been fabricated by methods other than welding, have excited the interest of every visitor to the Fair. The AWS Information Center reports that even the railings at the entrance to this exhibit hall are welded.



Though the items on display inside have been the object of some criticism at home, Americans abroad praise en masse *the U. S. pavilion. Welding aided in the fabrication of some basic components of the structure, which visitors from other countries have termed, "the most beautiful building at the Fair."*

Acrobatic skill and daring were expressively captured by the artist who welded this decorative unit—one of many sprinkled throughout the grounds in Brussels (see opposite page).

schweissen . . . *soudure* . . . svarochnoe . . . soldadura

A king and his queen proudly sit on their throne as the thousands of daily visitors to the Brussels Fair troop by their podium. This modernistic sculpture also is a product of artistry in welding

World's Fair

Welded free-forms in a cool and refreshing setting provide foot-sore visitors to the U. S. pavilion with a welcome reason for a pause in their tour of the vast Fair area.

The "Atomium" is to the Brussels Fair what the trylon and perisphere was to the New York World's Fair of 1939. In its finished state, the structure represents a metal crystal arranged in a body-centered cubic lattice of 9 atoms. Towering above the grounds, the Atomium is a tribute, not only to welding design, but to the unobtrusive appearance of welds themselves.

From this . . .

SURFACE of broken anvil is prepared for braze welding. Note overlap sheer margin.

by **R. L. Rectenwald***

REPAIRED anvil showing built-up area required 2,350 lb of bronze.

to this . . .

Braze welding saves an anvil

IN SEPTEMBER, 1957, an 8,000 lb forging hammer at Jessop Steel Co., Washington, Pa., struck what seemed to be its final blow . . . until welding stepped into the picture.

The 60-ton, semi-steel anvil of the forging unit had cracked and a 500 lb chunk had broken from the side, bringing production to a standstill.

Dovetails in the anvil top had previously been repaired by inlaying steel blocks in the damaged area. Although this temporary repair had prolonged the use of the forging equipment for several months, removal of metal for the inserts had greatly weakened the iron section.

Production schedules demanded immediate replacement of the unit's production capacity—either by installing a new anvil or by making suitable repairs. The problem was turned over to Maintenance Engineering Corp. of Pittsburgh, Pa.

Armed with case histories of similar repairs made over a period of several years, the corporation presented a convincing and workable three-point solution to the problem.

(1) Entire sections were to be braze welded to replace the two steel inserts in the dovetail area—as well as the piece broken from the anvil.

(2) The anvil was to be machined in place to original print dimensions.

(3) A hard, wear-resistant bronze was to be added to the dovetail surfaces.

Cost-wise, the proposed maintenance repairs totaled only 20% of a new anvil's replacement cost.

Actual welding time was planned in separate steps of 10 to 12 hours each. After careful preparation of the anvil — chipping all surfaces smooth and providing overlap boundaries around the periphery of all areas to be welded—the preheat furnace was laid out. (Earth fill around

*President, Maintenance Engineering Corp., Pittsburgh, Pa.

LOOKING like Martians at a cook-out, a team of weldors deposit weld metal through opening in furnace. Aluminum foil and aluminized fibre glass cloth were used for protection from radiant heat. Extensions added 40 in. to the torch lengths. Operation lasted six 12-hour days.

the anvil top was excavated about 3-ft deep and 3-ft wide to provide room for preheat fuel.)

The furnace was built of 11-gage plate in the form of shelves slanting in at 45 deg—about 12 in. apart and on all sides of the anvil. In this way the charcoal fire bed could be controlled for full furnace depth, could be recharged and cleaned of ashes, and temperature checked without any disturbance to the furnace. Perforated compressed air pipes were laid in the shelves to facilitate draft acceleration and ash removal. Preheat was started about 36 hours prior to welding operations.

Two teams of five weldors each alternated every 10 minutes. The entire anvil surface was covered with sheet metal, magnesia block insulation and asbestos paper to hold temperature and keep radiant heat from the weldors.

When the welding teams were ready, a 3-sq-ft section of insulation was removed and welding was started on the longest vertical edge to be filled. Vertical edges were built-up a little above horizontal surfaces. The torches were then maneuvered to overlap the welding areas, in order to concentrate at and hold temperature to the desired level.

Allowing about 7 to 10 lb of weld metal deposit per torch-hour, the work was laid out so that entire blocked areas were completed after each 12-hour shift. As welding approached the anvil center, additional preheat was provided by jumbo kerosene burners and propane heating torches—applied for approximately 10 minutes per hour. As each area was completed, the insulation was replaced and another work section was then opened.

Protective equipment included aluminum foil and aluminized fibre glass cloth over gloves and helmets, as well as arms and other portions of the weldors' bodies exposed to excessive heat. All welding torches had multiple extensions, adding about 40 in. to their total length. Welding operations continued in this manner for six working days—12 hours per day—with the teams of weldors continually changing.

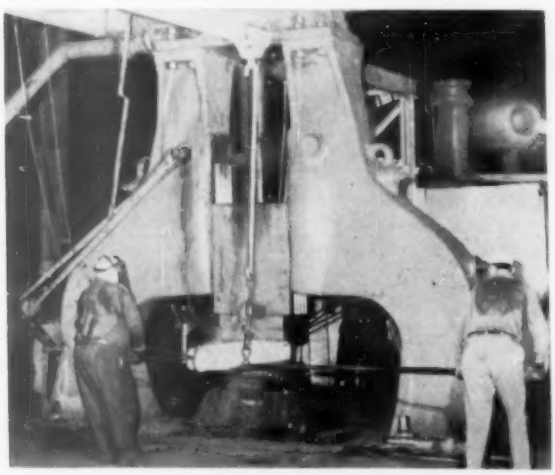
The repair welding was begun with 1,600 lb of Anaconda Tobin bronze—the total amount available in Maintenance Engineering's stock and all nearby warehouses. This particular bronze was chosen because of its high strength and narrow freezing range. The latter characteristic facilitated build-up of vertical welds and overhead positions—which are very difficult with more fluid materials.

Because of depleted inventories, other materials were tried as substitutes for the bronze—but it was discovered that welding time would have been doubled. A final 1,000 lb of the bronze was shipped to the job site from an associate firm in Lansing, Mich.

The completed weld required 2,350 lb of $\frac{3}{8}$-in. bronze welding rod. Other materials consumed: 66 cylinders of oxygen; 29 cylinders of acetylene; 4 cylinders of propane; 20 gal of kerosene; 3 tons of charcoal; 2 tons of coke; 800 lb of asbestos felt; and 33 lb of flux.

The anvil was allowed to cool for five days before machining operations were begun. A portable draw shaper was then set-up in proper alignment with the hammer frame, and the entire top surface of the anvil—including the two dovetails—was machined to original print dimensions and tolerance. Set-up and machining required the equivalent of 12 eight-hour shifts.

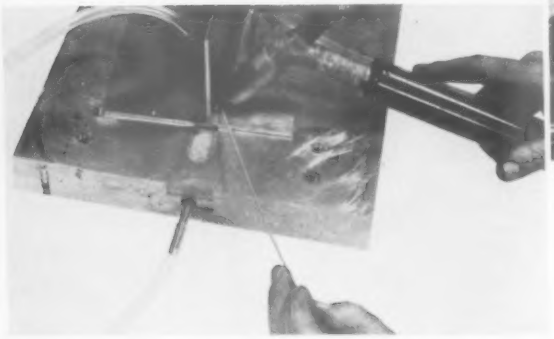
The restored anvil has now been in operation for one year—forging 16-in.-square steel ingots weighing up to 3,000 lb—with no indication of distress in the repair area.



RESTORED forging unit in operation hammering 16-in.-square steel ingots weighing up to 3,000 lb.

MORTAR base plates of titanium being welded by semiautomatic Mig process. Below: Tig welding of titanium assembly outside of the controlled atmosphere of a welding chamber.

Mallory-Sharon notes that whether you use Mig or Tig when welding titanium . . .



ABOVE: titanium weldments being joined by weldor in controlled atmosphere of a welding chamber.

Proper shielding=sound welds

TITANIUM is extremely prone to embrittlement by oxygen, nitrogen and hydrogen. Titanium is also highly reactive at elevated temperatures and readily combines with oxygen and nitrogen—and with all known refractories.

These two characteristics of titanium exert the greatest influence on welding, so both face and back of titanium weldments must be protected from this contamination. In which case, either Mig (metal inert-gas) or Tig (tungsten inert-gas) welding becomes mandatory. Both processes have been used to join thin sheets, heavy plates and forgings—with excellent results.

Joint designs for titanium being welded by either of these processes are similar to those for stainless steel, (*e.g.*, butt, fillet and corner welds).

When butt welding thin sheet, square-butt joints with practically no root opening are preferred and filler metals are not used. But when sheets exceed 0.06 in. in thickness, a root opening or single V-joint design is used to insure complete penetration and filler metals are used.

For heavy sections, single and double-V butt joints are used, while corner welds call for both open and closed designs. The number of welds coming together at any one point should be kept to a minimum.

Edge and surface preparation before welding is important in controlling contamination and porosity caused by titanium's extreme chemical reactivity. To minimize contamination, joint edges and adjacent surfaces must be free of scale and other foreign matter.

Although material received from the mill is generally scale-free and requires only degreasing prior to welding, hot-formed or annealed material has surface scales. In this case, mechanical cleaning—sand or grit blasting, or machining—or molten salt bath descaling together with pickling in nitric-hydrofluoric acid solution, are necessary preparations prior to welding.

Although the exact causes of weld porosity are not known, recommended procedures for minimizing this failing are draw filing, abrading and wire brushing.

CORROSION PROPERTIES OF TITANIUM, ZIRCONIUM, TANTALUM AND TYPE 316 STAINLESS STEEL

	Titanium	Zirconium	Tantalum	Stainless Steel Type 316
Acetic Acid	5, 10%, 68 F, excellent	5, 99.5%; 140, 212 F, excellent	All %, 68-735 F, excellent	5%-glacial, 95-390 F, good
Aluminum Chloride	10%, 95-212 F, excellent	20, 30%; room-boiling, excellent	—	—
Ammonium Hydroxide	28%, room temp., excellent	28%; room-212 F, excellent	—	All %, good
Aqua Regia	65-140 F, excellent	65-140 F, poor	65-140 F, excellent	—
Calcium Chloride	10, 25%, 95, 121 F, excellent	20, 30, 50%; 68, 120, 313 F, excellent	—	5%-saturated, 95-212 F, poor
Carbon Tetrachloride	1-99%, boiling, excellent	100%; room temp.-120 F, excellent	—	Room temp., good
Chlorine Saturated H_2O	Room temp., excellent	Room temp., excellent	—	95-212 F, poor
Chromic Acid	10%, boiling, good	10, 20, 30%; 68, 120, 212 F, excellent	—	10-50%, 95, 212 F, fair to poor
Cupric Chloride	1-15%, 95 F, excellent	1-25%; 95 F, poor	—	1-5%, 70 F-boiling, poor
Ethyl Alcohol	95%, boiling, excellent	95%; boiling, excellent	—	—
Ferric Chloride	1-20%, 65-212 F, excellent	2.5-30%; 65-212 F, poor	5-30%, 65 F-boiling, excellent	1-5%, 70 F-boiling, poor
Formic Acid	25-90%, 95 F-boiling, good-poor	90%; 68, 120 F-boiling, excellent	90%, 212 F, excellent	5%, 160 F, fair to poor
H_2O Saturated, Chlorine	Room temp., excellent	Room temp., poor	—	—
Hydrochloric Acid	5%-concentrated, 95-212 F, poor	Dilute-excellent, all temp. concentrated at room—excellent concentrated at boiling—poor	19%-concentrated, 65-212 F, excellent	Dry, moist, 68 F, poor
Hydrogen Peroxide	Room temp.-30%, CP-poor, A.C.S.-excellent	10%; 120 F, excellent	—	—
Lactic Acid	85%, 95 F-boiling, excellent	5-85%; boiling, excellent	—	5, 10%, 95 F-boiling, poor
Mercuric Chloride	1%-saturated, 95-212 F, excellent	1%-saturated; 95-212 F, excellent	Saturated at 212 F, excellent	0.5%-2%, 70 F-boiling, poor
Mono-Chloro Acetic	100%-boiling, excellent	100%; boiling, excellent	—	—
Nitric Acid	5%-concentrated, 95-212 F, good	10%-concentrated; 65-212F, excellent	Concentrated, 65-185 F, excellent	Dilute, excellent; poor in concentrated, at boiling
Oxalic Acid	1-25%, 95, 212 F, poor	1-25%; 212 F, excellent	Saturated, room-205 F, excellent	10-25%, 70 F-boiling, poor
Phosphoric Acid	1-85%, 65-212 F, excellent in dilute concentration at room—otherwise poor	10-85%; room-212 F, excellent to fair	85%, 290-410 F, excellent	10-85%, 68 F, boiling, poor
Sodium Chloride	3%, 95 F, excellent	3%; 95 F, excellent	—	5%, 68 F, good
Sodium Hydroxide	10, 40%, 175 F-boiling, good	10, 50%; room-212 F, excellent	5, 40%, 212, 230 F, dilute—excellent, 40%—poor	All %, 175-600 F, excellent except in dilute boiling
Sulfuric Acid	5-65%, 65-95 F, dilute—good, concentrated—poor	10-90%; 65-212 F, excellent in dilute, poor in hot concentration	20%—concentrated, 65-570 F, excellent	25%-concentrated; good at 68 F; poor at high temp.
Tannic Acid	25%, 95 F, excellent	10%; room temp.-boiling, excellent	—	—
Tartaric Acid	50%, 95 F, excellent	10, 25, 50%; 68, 120 F-boiling, excellent	—	—
White Fuming Nitric Acid	Room temp.-180 F, excellent	Room temp.-180 F, good	—	—

EXCELLENT: Less than 0.0005 in. penetration per year
GOOD: 0.0005 to 0.005 in. penetration per year
FAIR: 0.005 to 0.010 in. penetration per year
POOR: More than 0.010 in. penetration per year

Material Thickness, inch	Groove		Hold-Down Spacing, inch
	Depth, inch	Width, inch	
0.020-0.032	3/64	3/16	1/4
0.032-0.040	3/64	1/4	5/16
0.040-0.064	3/64	3/8	7/16
0.060-0.072	1/16	7/16	9/16

BACKING bar groove and hold-down spacing for automatic inert-gas welding of equal gages of titanium.

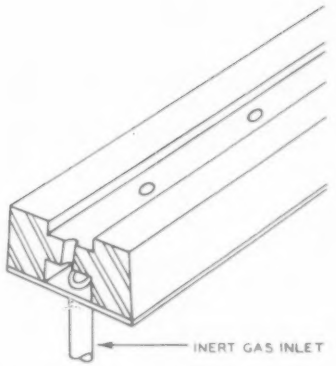


FIG. 1—Inert-gas shielding is supplied to the bottom side of the weldment by a backing bar arrangement.

Joint edges are often degreased just before welding.

Welding conditions depend on equipment, shielding, joint design and metal thickness, and it is generally necessary to establish these conditions on test specimens before welding the assemblies.

Joints are made with and without filler metal when Tig welding, however, welds made without filler metal are easier to shield. The filler wire is fed either by machine, by hand or preplaced in the joint, but when feeding by hand, the wire's hot end must be shielded from the air.

[For an informative article on selection of filler metal when welding titanium, see: *Filler wire is the key to better titanium welds*, WELDING ENGINEER, June, page 45.—*Ed.*]

Using d-c straight polarity when Tig welding provides arc voltages ranging from less than 7 to more than 25 volts; welding currents from less than 50 to more than 300 amp; and travel speeds from less than 5 to more than 30 ipm. Welding currents and speeds have more effect on penetration than other variables.

In Mig welding d-c reverse polarity provides better metal transfer, greater arc stability and less spatter than either d-c straight polarity or a-c. High current densities are required and arc voltages range from 25 to 35 volts. Filler wire 1/16 in. in diameter requires welding currents of around 300 amp with welding speeds ranging from less than 20 to more than 40 ipm.

Conventional welding heads are used for both Tig and Mig welding.

Selection of either of these two welding processes depends to some extent on metal thickness. Since it requires lower current densities and allows better control of weld penetration, Tig is used for sheet metal assemblies. When welding heavy sections, both processes are used, but Mig is preferred because of its higher deposition rates and fewer required weld passes.

Of the two shielding gases most often used, helium provides faster welding speeds and greater penetration, but argon is used to a greater extent, since it allows lower gas flow rates for comparable coverage, easier penetration control and—when Mig welding—better metal transfer. (Mixtures of the two are used most frequently with Mig welding.) Gas flow requirements will vary with torch cup size, material thickness, welding speed, current and back-up for the specific job.

The most important consideration when welding titanium is adequate shielding—obtained either through welding chambers or backing bars.

Inert-gas-filled welding chambers afford two advantages: *(1)* elimination of elaborate jigs and fixtures when complex shapes are welded, and *(2)* more uniform shielding for manual welding.

Welding chambers vary in size and shape; in some, the entire assembly to be welded is placed inside, while in others, only part of the assembly is sealed off. Ideally, a chamber which can be partially evacuated before backfilling with inert-gas affords the best protection.

When evacuation is not possible, air and other gaseous contaminants are eliminated by inert-gas purging. Common practice is to strike an arc on titanium scrap so the molten metal will absorb any remaining contaminants before welding is begun.

TITANIUM tail assembly of jet plane is joined by resistance seam welding process. Lack of molten titanium eliminates need for inert-gas shielding.

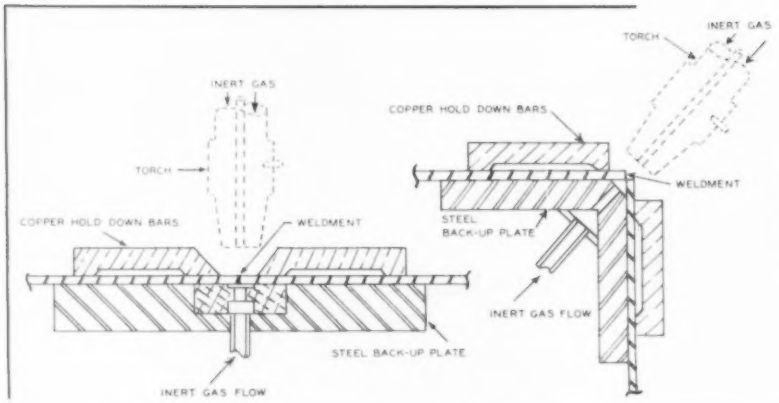


FIG. 2—Incorporated into the welding fixture, the backing bars shown are used in making butt welds on thin sheets while supplying inert-gas shielding to the back of the weldment.

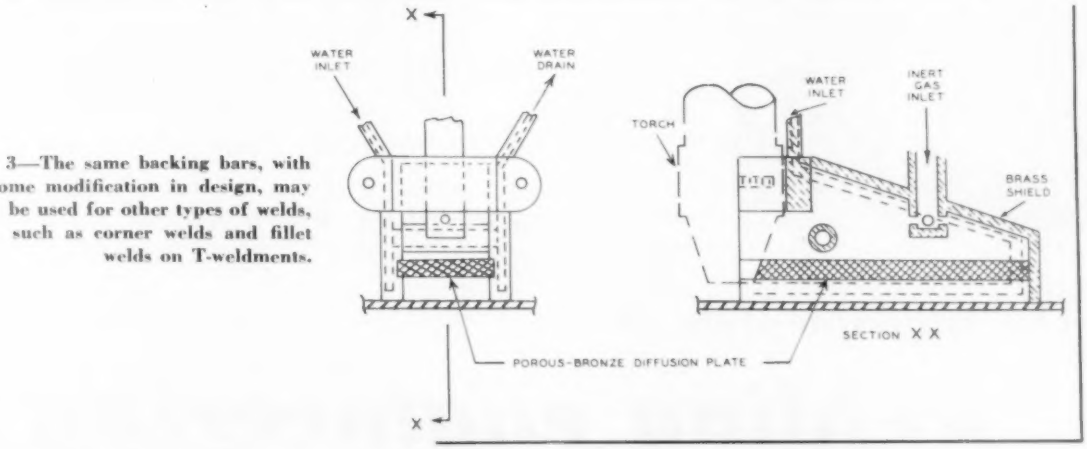


FIG. 3—The same backing bars, with some modification in design, may be used for other types of welds, such as corner welds and fillet welds on T-weldments.

The second means of shielding titanium—backing bars—is usually incorporated into welding fixtures. Figure 1 shows the type used in making butt welds on thin sheets while supplying inert-gas to the back of the weldment. For other weld designs (*i.e.*, corner welds, fillet welds on T-weldments, etc.) the same backing bars with different designs are used. (Figure 2.)

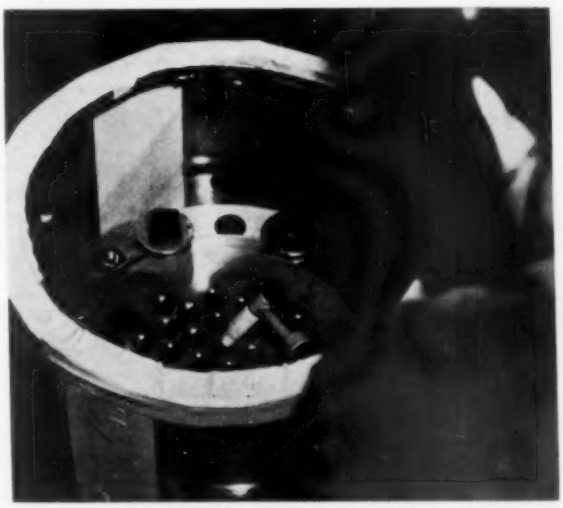
Generally, bar grooves vary with metal thickness and are designed for complete penetration and root fusion without excessive "drop through." (Recommended groove dimensions are listed in the table.) The amount of inert-gas supplied through the bars ranges from less than 5 to more than 30 cfh.

At times welds made in thin sheet at relatively slow speeds can be adequately shielded by inert-gas from the torch by use of larger gas nozzles and proportionately higher gas flow rates. On the other hand, for heavier sections or faster welding speeds, trailing shields are required to protect the welds as they cool.

Figure 3 is an example of a trailing shield. Copper hold-down bars alongside the joint increase weldment cooling rates, act as baffles and are helpful in welding with or without trailing shields. (Recommended spacings for hold-down bars are also listed in the table.)

Although bend tests have proved adequate for evaluating shielding conditions, the only non-destructive evaluation test is surface examination. However, this is not always reliable and should be used with caution as a criterion for judging weld contamination. Generally, surface examination is used in conjunction with bend tests for quality control on sample weldments.

[In a future issue of WELDING ENGINEER, a report from Germany will show that good mechanical properties can be obtained when Tig welding titanium. Watch for it.—*Ed.*]



PLASTIC chamber is used to contain inert-gas atmosphere when Tig welding titanium heat exchanger tubes.

ABOVE the daily rush and hurry of New York City some of the nation's 350,000 weldors are to be found—making welding's advantages of strength, appearance and economy available to the American public.

by **T. B. Jefferson**

In this second chapter, job opportunities in welding are discussed, qualifications and available aids are listed, and welding's contributions and future are reviewed....

The fundamentals of *welding engineering*

IN THE WELDING INDUSTRY today, job opportunities are divided into three major categories: (*1*) the weldor; (*2*) the welding technician, and (*3*) the welding engineer.

There are more than 350,000 weldors now at work in the U. S., and they represent the broadest possible range of job skills. Some weldors must be highly skilled to handle a variety of metals and operate more than one welding process. At the other end of the spectrum are weldors with limited skills who have to make only a simple spot weld on production-line items—or who are required only to supervise the welding sequences of automated machines.

But regardless of his skill, the weldor is the man all industry relies heavily upon. He is the foundation on which the success or failure of many designs must be based.

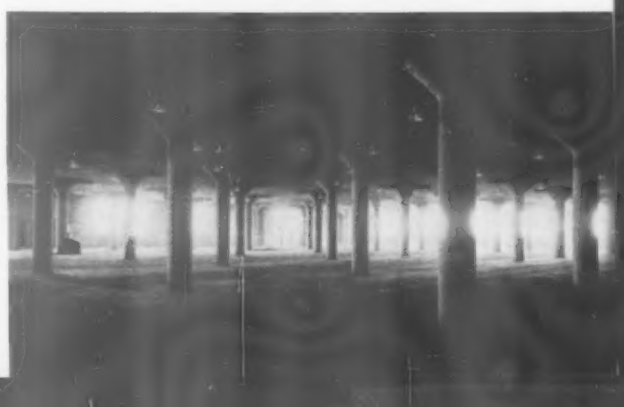
Occupying the second category is the welding technician. Although he may not carry this precise title, he is a skilled weldor who has augmented his skill by further studies which give him solid, practical knowledge of his field. Operating techniques, blueprint reading, mathematics, production processes and other phases of industrial operation have been added to his scope.

Regardless of whether he is known as group leader, welding foreman or engineering liaison man, the welding technician is a man who "knows his stuff" when it comes to welding.

Third in the list of welding job categories—and the one which will be of primary interest to us in this series of articles—is the post filled by the welding engineer.

Welding engineering is an extremely complicated field . . . one in which scientific principles are applied to the useful arts. And unlike more confined branches of engineering, welding engineering requires a working knowledge of the fundamentals of electrical, metallurgical, mechanical and civil engineering—coupled with know-how in physics and chemistry.

BELOW: The cool confines of the North Exhibition Hall of Chicago's International Amphitheater belie the heat of thousands of electrodes used in welding the columns. Almost $150 million were spent for electrodes in 1957 alone.



WELDING not only plays an important role in the original fabrication of farm machinery, but also becomes the farmer's "magic wand" when maintenance welding is necessary.

Welding engineering is new—so new, in fact, that only a few colleges in the U. S. offer courses leading to this degree. And many of the sciences with which a welding engineer works are also comparatively new.

Welding engineering is a profession embracing not only the tried-and-true "engineering axioms" which have come down to us through the ages, but a new concept of principles developed within the past 80 years.

The welding engineer should understand welding fundamentals, yet be able to work with processes and procedures other than welding. And while we mention management last, it is certainly not the least of those areas of training required for a welding engineer. He must learn to properly coordinate the activities of men, material and equipment.

So it is obvious that welding engineering is broad in scope. And so it must be to produce a man qualified to:

1—Design, or correlate the design of objects to be fabricated by welding and other means.

2—Specify metal types to be employed in parts production.

3—Determine the most satisfactory parts design, considering such factors as ease of fabrication and accessibility.

4—Specify welding procedures and equipment to be used.

5—Test and inspect welded parts—and evaluate and correct defects—in the light of metallurgical knowledge and experience with the action of welding heat on metals.

6—Direct the activities of a metal fabrication department and assume managerial responsibilities.

Assistance in qualifying for this six-point talent program comes from the numerous codes and specifications developed for the welding industry—many by the American Welding Society itself, or in cooperation with other organizations.

AWS has joined with the American Society for Testing Materials to formulate rules governing use of almost every kind of filler metal for all welding methods. Standard welding symbols were developed in conjunction with American Standard Association. Welding terms and definitions, a master chart of the welding processes, standard methods of mechanical testing of welds and safety practices when welding or cutting are other contributions made by AWS.

Welding engineers can obtain further assistance from various codes dealing with such subjects as instruction requirements, standard qualification procedures and inspection of metal-arc welds. Even recommended practices for resistance welding, metallizing and brazing have been codified.

Various industrial applications of welding have also been documented in codes and specifications—covering such areas of construction as buildings, bridges, storage tanks, aircraft, automobiles, piping and ships. (Best known of these codes are: *Standard Code for Arc and Gas Welding and Building Construction*, and *Standard Specifications for Welded Highway and Railway Bridges.*)

Welding's versatility, significance and progress in American industry cannot be denied. It is the *only* fabricating means able to meet the maintenance and produc-

STREAMLINED trains travel daily over miles of continuous track—and the welder is heavily relied on by the railroad industry to produce and maintain these trains and tracks. Of the metal-working plants in the country, 92% use welding. Of that total, 85% use it for maintenance and 72% for fabrication of some kind.

FROM kitchen appliances to huge highway and railway bridges—in 25 years the welding industry has increased its sales more than 2,800% to a level of nearly $1 billion. During 1957 in the U. S. alone, an estimated $150 billion in goods were produced by welding.

tion requirements of almost every industry.

However, with each new application of welding, there naturally arise new problems for design, process and welding engineers to solve. Cracking of treated materials, loss of ductility, comprehending rigid frame design, effects of loading, out-dated design techniques—these are but a few of the problems facing every engineer when welding is first introduced into maintenance or production.

But welding is not difficult! These new problems resulting from the adaptation of welding processes to high production can be effectively met through broader training, new methods and new tools.

Welding's role in our everyday lives is larger than usually acknowledged—not because of poor observation, but rather because of poor welding education.

Rarely are household products thought of in terms of welding—yet welding is everywhere, from the refrigerator and coffeemaker in the kitchen, to patio furniture and the iron gate at the end of the walk.

And last but not least in the long list of welded products seen in or near the home is the automobile. Although the welding dollar spent in modern-day production of a car is small (probably less than $25), every dollar spent provides an estimated savings of $100 to the owner through reduced prices.

It is difficult to avoid welded products. Welding has provided needed strength to hold huge engines in aircraft wings, as well as making possible metal joints able to withstand the high heats and pressures of jet engines. Tractors and farm equipment in the fields, earthmovers for highway and airport construction, streamlined trains on continuous steel track, a pipeline network covering the country—all are evidence of welding's contribution to the American economy.

Where can it go? What is its future?

Welding can only advance to a bright future!

Although the growth of the welding industry has been phenomenal, certain individuals maintain that the various welding processes are not being used in one-tenth the places they could be. This is fallacious.

And here are the facts:

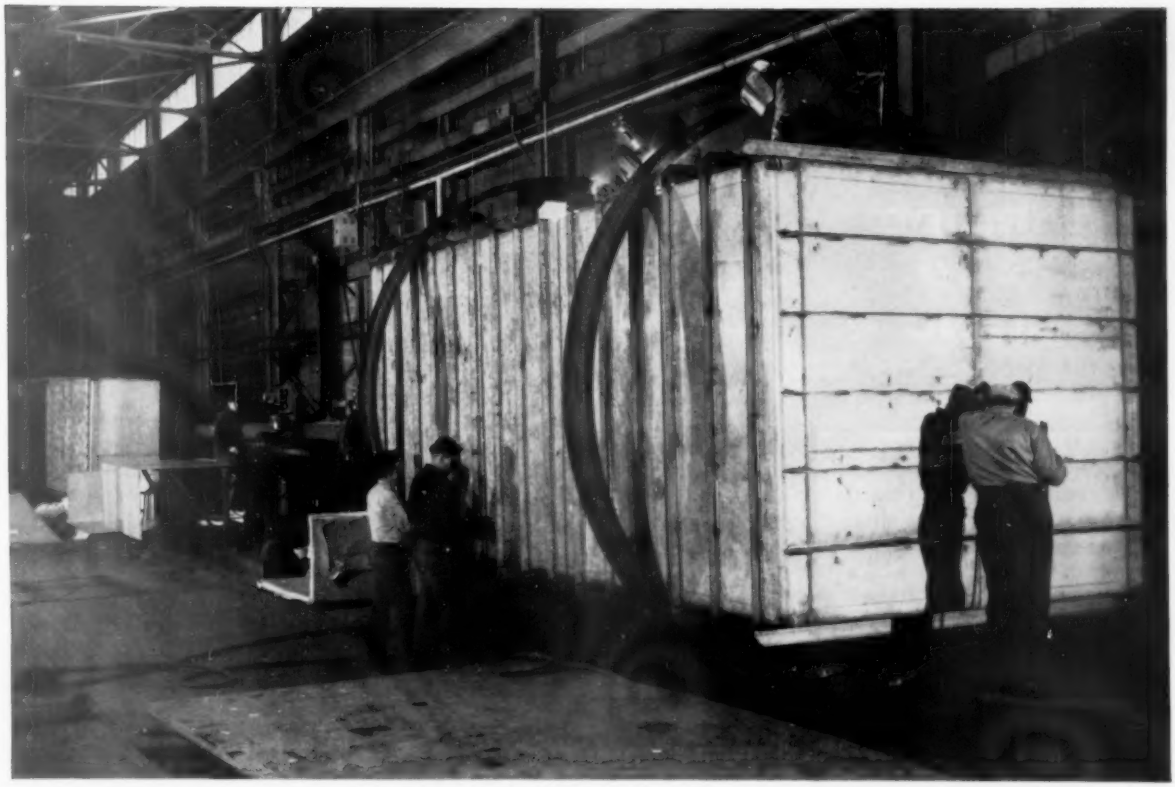
Surveys conducted by WELDING ENGINEER show that 92% of the metal-working plants in the country use welding. Of these, 85% use it for maintenance, while 72% depend on it for fabrication of some kind.

In 25 years, welding has grown from a $33.6-million industry to its present-day level of nearly $1 billion—an increase of more than 2,800%. The total value of goods produced by welding in 1957 was an estimated $150 billion in the U. S. alone.

With these considerations, welding's future cannot help but be bright for those choosing to work for that future in an expanding world economy.

The welding processes: They are basically the same as they were in their beginnings—but new improvements are being made to gain better strength, appearance and economy. They will be detailed in the next article in this series.

AIRCRAFT parts are only a few of the many items welded in the aircraft industry. Without welding, a weight-penalty would result and supersonic speeds could never be achieved by today's jets, nor could satellite-bearing rockets have had their present-day success.



For Stainless Welds with Quality Plus . . .

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The large tank illustrated above is one of several constructed by Chicago Steel Tank Co.,* Chicago, Ill., designers and fabricators of steel vessels. These vessels, which measured 8 feet wide, 9 feet high, and 20 feet long, were fabricated of type 304 stainless steel plate. The welding procedures employed were the responsibility of Henry Rouson, welding engineer, who selected Arcaloy type 308 AC-DC stainless steel electrodes for all of the manual welds.

Henry Rouson specified Arcaloy electrodes for this job, just as he has for many others. The requirements for quality at CST demand a little more than the usual high quality expected of a stainless steel electrode. Good appearance and uniformity of weld are considered extremely important.

* A Division of U. S. Industries, Inc.

Stainless steel or stainless clad material is used on critical applications for its corrosion resistance and high strength properties and the fabricator of these materials knows that electrode selection must be made with care to preserve these qualities. Alloy Rods Company has provided in Arcaloy stainless steel electrodes all of the necessary qualities for sound stainless welding, plus welding characteristics which have made this electrode a favorite of both welding management and their weldors.

There are 25 types of Arcaloy stainless steel electrodes in lime or AC-DC (titania) coatings that will improve your products . . . provide a better quality weld metal. Write for Bulletin AR-10-2 Alloy Rods Company, P. O. Box 1828, York, Pennsylvania.

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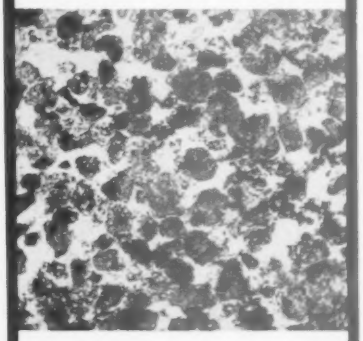

Photo-micrograph of sprayed coating, showing high tungsten carbide (dark particles) concentration. Mag. 50x – actual size of area shown, approx. .040" x .040". (Photo courtesy Sam Tour & Co., Inc.)

These coatings are non-porous, homogeneous, have very high tensile strength and provide excellent wear resistance under the most extreme service conditions.

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On a "Christmas tree" . . .

Welding satisfies rigid chemical industry criteria

By Robert Utnehmer
Ampco Metal, Inc.

CHEMICAL MANUFACTURERS and refineries are often faced with the problem of high pressure applications at elevated temperatures under very corrosive conditions.

The unit pictured is an autoclave expansion block "Christmas tree" that never takes a holiday. It is used for distribution of synthetic urea in one operation of the chemical manufacturing process.

Fabrication requirements were extremely rigid and all welds had to be completely free of defects and were 100% X-rayed. The unit was hydrostatically tested at 5,000 psi while a water jacket, extending from the top to the bottom flanges, was tested at 300 psi.

EXPANSION block "Christmas tree" used in chemical industry was Tig welded with ECu Al-B filler rod. All welds were 100% X-rayed and unit was hydrostatically tested at 5,000 psi.

Filler wire for fabrication was "Ampco-Trode 160" (AWS: ECu Al-B) because its physical properties and chemical composition were identical to the castings used in construction.

By having a weld deposit of similar properties, the problem of selective corrosion in the weld zone—because of difference in corrosion resistance or galvanic coupling—was completely eliminated.

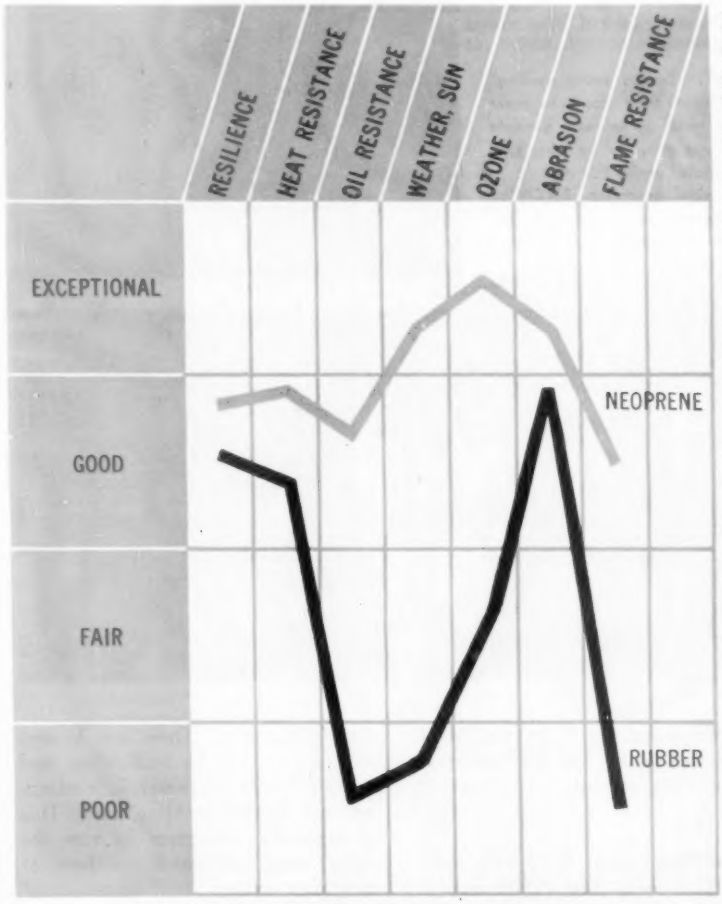
The ECu Al-B filler rod was applied by the Tig (tungsten-inert gas) process using d-c straight polarity, and helium as the shielding gas. Thoriated tungsten electrodes 1/8 in. in diameter at approximately 275 amp were used to deposit the 5/32-in.-diameter filler rods.

Although argon with a-c and superimposed high frequency may be used in most aluminum-bronze fabrication, d-c and helium were chosen for this weldment. Wall thickness at the weld joints was 1 in., and helium gas—having hotter emission characteristics—assisted in gaining deeper penetration and a more controllable arc than obtained with argon.

A maximum gas flow of 40 cu ft per hour was maintained. This method of welding, says Ampco, can be expected to produce a sound deposit with good appearance.

Users of equipment of this type are constantly searching for material that will stand up for long periods without maintenance. Several years of continuous service can reportedly be expected from the unit without shut-down for maintenance and repairs.

HERE'S PROOF THAT **PHELPS DODGE HABIRPRENE** (NEOPRENE) **ARC WELDING CABLE** IS STRONGER, LASTS LONGER!



(Adapted from chart of Elastomer Chemical Dept., E. I. du Pont de Nemours & Co., Inc.)

Phelps Dodge Habirprene arc welding cable combines maximum flexibility with the greatest resistance to deterioration caused by exposure to harmful physical, chemical and mechanical conditions. The ability of Habirprene welding cable to withstand greater overall wear and tear, as compared to rubber welding cable, is shown in this chart compiled from comparison tables of four rubber goods manufacturers.

Phelps Dodge pioneered the fabrication of Habirprene welding cable, the first real advance in this field, more than 10 years ago. Records show that Habirprene cable lasts much longer than rubber cable and—in some applications—as much as *four times longer!* Although the initial cost of Habirprene is slightly higher, it will more than repay you in long-time service. Habirprene arc welding cable meets full requirements of A. S. T. M. D752.

See your authorized Phelps Dodge distributor for Habirprene arc welding cable with the indelible gold markings—the sign of higher quality, longer-lasting cable.

Phelps Dodge also makes a full line of rubber arc welding cable and welding power supply cable. All the above cables are available from stock.

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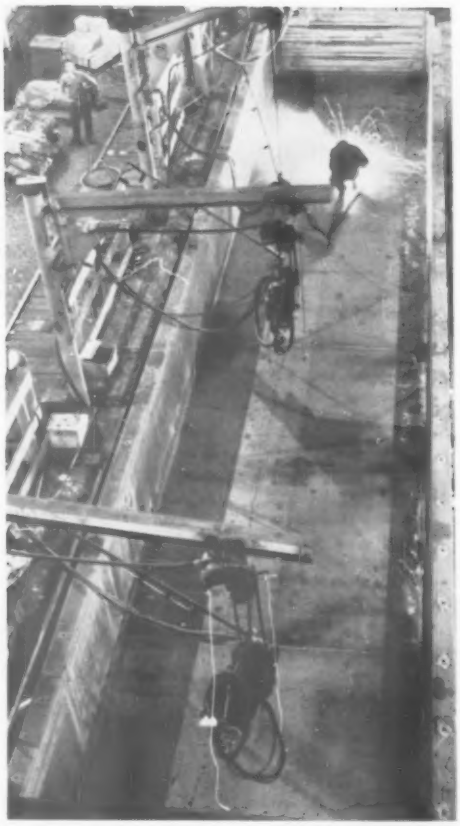
This fabricator now "packs" up his wire troubles

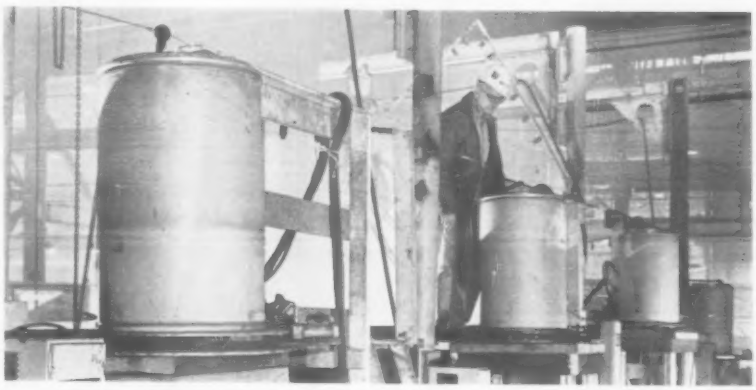
By R. E. Butler
Air Reduction Sales Co.
Pittsburgh, Pa.

FIVE HUNDRED MINUS twenty-five equals 475. That is the extra weight of filler wire now available to railroad car weldors—475 lb.

By using "Wirepaks" containing 500 lb of filler wire instead of 25-lb wooden spools, a leading fabricator of railroad equipment has been able to save many dollars. The reason: *volume.*



RIGHT: Workers swing welding gear down from boom to make 9½-ft welds in railroad gondola cars. Mig guns fed by Airco's "Wirepaks" make this an economical operation. BELOW: An inspector looks over a bank of wire containers, each of which holds 500 lb of welding wire.



In less than 18 months, the manufacturer has seen 4,400 gondolas and hopper cars roll off his assembly line. When this much work must be done, an easier method and less expensive technique obviously creates greater production savings.

This is the principal reason welding—and the wire packs—met work requirements. Large amounts of wire in fewer containers can be purchased for less than smaller and more numerous wire packages. Labor time involved in wire-feed supply changeovers is also cut.

The welding method was Mig (metal inert-gas) using CO_2 as a shielding gas. But 500 lb of filler wire is a good deal heavier than most weldors care to handle. For this reason, four containers, each carrying wire, were mounted in a row and supported by scaffolding.

On this scaffolding are fixed booms and pulleys to maneuver the welding units lowered to weldors. The number "four" seems to be the key number, because four weldors work—one from each container and one from each machine.

The job itself requires four horizontal joints 9½ ft long across the bottom width of each car.

Working inside the 62 ft. car length, weldors must make square butt welds on the ⅜-in. mild-steel. Plates and their ⅛-in. to ⅜-in. root openings are supported by a backing plate.

Welding wire is A-675 mild-steel. This feeds through the gun at approximately 375 ipm, depositing 20½ lb of wire per gun per arc hour. Current is 450 amp d-c reverse polarity.

Two CO_2 containers supply each weldor. Flow rate is 30 cu ft per hour. Supporting equipment consists of 600-amp contactors and water-circulating units. These are located at the base of the scaffolding and contain 40 gal of water in continuous use to cool welding guns. This is especially important because the latter must withstand the heat of long duty cycles.

All this adds up to economy. But even more savings are effected by: *(1)* elimination of plate preparation because of Mig's penetration and deposition characteristics; *(2)* low-cost CO_2 shielding, and *(3)* high production speeds possible with the coordinated four-gun setup.

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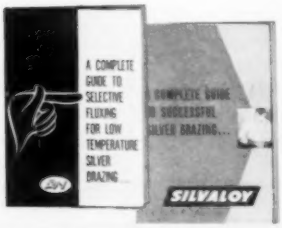


Two complete reference manuals for low-temperature silver brazing and fluxing are available upon request. Send for either one or both. ★ ★ ★ ★ ★ ★ ★

Industry has noticed:

Shift to welded joints for small diameter pipe

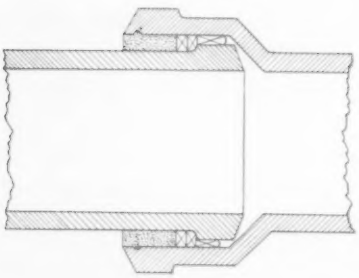
By H. A. Sosnin

IN THE LAST century, most of the pipe used for conveying fluids was joined by threading. A smaller amount was joined by such older methods as caulking, packing, or by the use of compressed gaskets.

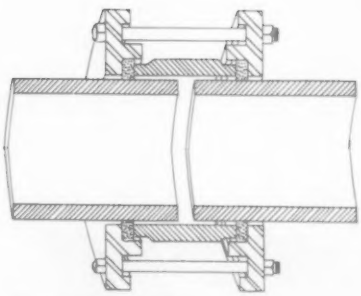
But as compressed acetylene and oxygen became available for industrial welding equipment, they caused the pipe-joining picture to change rapidly. And that change has been to pipe joined with oxyacetylene and air-acetylene flames.

The series of accompanying diagrams shows the centuries-old meth-

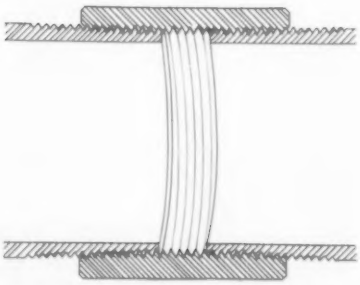
Olde . . .



CAULKED joint is probably the oldest method of joining pipe. It is used mostly on underground cast iron piping for drainage, water and gas distribution. It is not as popular for these three uses as it once was.

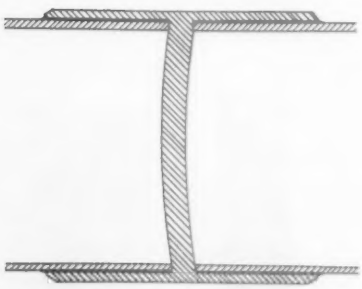


COMPRESSION joint is used on cast iron, steel and transite pipe at comparatively low pressures and temperatures. Plain-end pipe with compression joint sees commonest service in water and gas distribution.

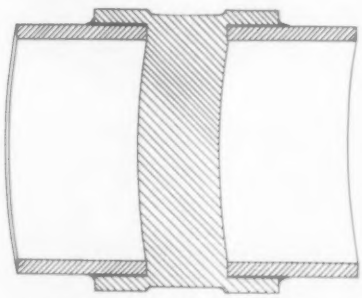


THREADED joint is used on steel or wrought iron pipe, or any metal cheap enough to be made with heavier-than-necessary wall. Though lacking in economy and efficiency, it is the commonest mechanical joint used today.

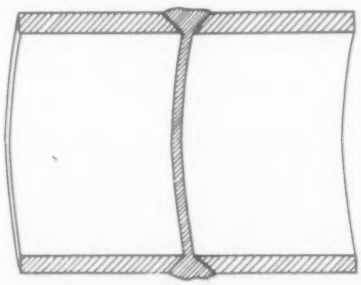
New . . .



MADE with 50-50 solder and an air-acetylene flame, this joint is used almost exclusively on copper and brass pipe or water tubing. This joint has almost completely replaced threaded pipe in plumbing systems. It is becoming more competitive with threaded joints for domestic heating and drainage.



BRAZING alloys and oxyacetylene flame make this welded joint. It is used mostly on copper and brass pipe and tubing for plumbing, heating and air-conditioning, and on industrial piping. It is becoming more popular for use with steel, wrought iron and stainless steel.



WELDED pipe joints are used at high pressures, high or low temperatures, and can withstand high stresses. Welding is economical and efficient in joining small pipe used for heating, air-conditioning, compressed-air flow lines and water and gas distribution. Welding now joins about 60% of all small-diameter pipe.

ods of caulked, compressed and threaded joints—plus the modern soldered, brazed and welded joints.

Threaded joints, which still provide some competition for metallurgical joints, comprise a high percentage of mechanically-joined pipe.

Table No. 1, however, compares wall thickness of schedule 40 IPS pipe and the depth of thread at the root. It shows how much the joint and metal can be weakened—and the obvious wastefulness. Oxyacetylene welding, soldering or brazing eliminate threading, making pipe connections stronger than a heavier threaded pipe.

Comparative pipe wall thickness

Nom. Size	Sch. 40 Pipe Wall	Depth of Thread	Effective Pipe Wall
2½	0.203	0.09850	0.105
2	.154	.06957	.085
1½	.145	.06957	.076
1¼	.140	.06957	.071
1	.133	.06957	.064
¾	.113	.05714	.056
½	.109	.05714	.052

Table No. 1

The pipe and wall fitting can be lightened 50% or more, *without lowering efficiency of the piping system,* if all joints are welded. This saves time, money and materials. For mechanical joints, twice as much pipe as is necessary must be purchased, then half is cut off at the joint area and discarded. This is a money- and time-consuming practice.

If a pipe wall of 0.064 in. is needed in a 1-in. pipe, why buy a 0.113-in. wall, cut off half around the joint area, and throw it away?

Welding, brazing and soldering, though requiring more skill, take less physical effort and time than does threading and wrench tightening. This means more work can be done in less time.

These are good points to use in selling oxyacetylene welding to those skeptics who still thread pipe.

Based on a paper given at a recent International Acetylene Association convention. Mr. Sosnin is a special representative for Tube Turns, Louisville, Ky.

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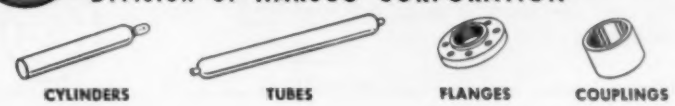
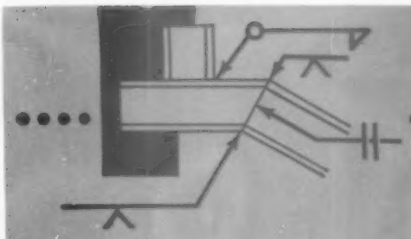




the welding clinic

Here you may find the solution to your welding problems, whether they concern design, production, construction or maintenance welding. Submit your questions for answering on this page.

Welding saw blades and putting torches on wheels

Question:

Can saws be repaired by welding?

Answer:

Cracks and breaks in band saws and circular saws can be repaired. Broken teeth can be replaced by welding in teeth from an old saw. This kind of welding job isn't difficult but special jigs generally are necessary.

Band saw steels are usually made of nickel, chrome, molybdenum steel, or other alloy steels suitable for the purpose. Carbon content is often around 0.70%, and welding rods should approximate the alloy. An excellent rod is one of chrome-vanadium steel with about 0.80 to 1.10% chromium, 0.15 to 0.18% vanadium and 0.40 to 0.50% carbon.

Jigs for band saws must be designed so that broken or cracked saw parts can be clamped just above an anvil and, by moving a foot lever, be brought in contact with the anvil to be hammered.

The torch must be small and the flame exactly neutral. It is vital that no oxide or slag particles are entrapped in the weld.

Begin welding at the inner end of the crack and proceed toward the open end. Only about 3/8 in. or 1/2 in. should be welded at a stretch. Then the saw is brought down to the anvil and peened with a light hammer. Peen only when the metal is at forging heat, and repeat the cycle until the crack is completely welded.

If the break extends completely across a band saw, the first weld is made in the center of the saw and then on each side of the center, alternately, until the parts are joined.

Circular saws are usually welded in a similar manner, beginning at the inside end of the crack, welding about 3/8 in., then peening. The saw is quickly turned over and the opposite side welded and peened. This is continued until welding is completed.

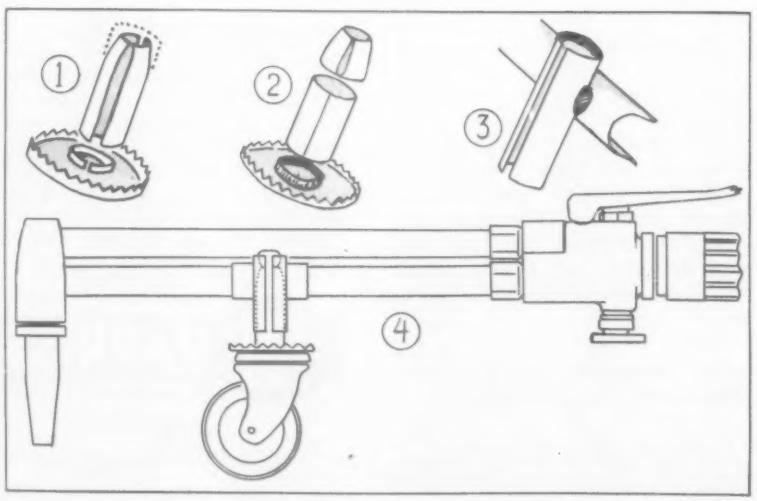
* * *

Andrew Vena of Philadelphia offers this idea for adding stability to a flame-cutting torch. A caster is used to aid in holding the torch tip at a proper distance from the cut, to help maintain a correct angle while beveling a plate edge, and to steady the operator's hand when cutting circles or curves.

The wheel is made from a swivel-type furniture caster. Choose the size best fitted to the torch, but be sure the wheel is metal rather than rubber to avoid any possibility of fire. Also needed are parts from two other caster sockets.

Cut one socket *(1)* to serve as a clamp. Cut the other socket *(2)* to form a sleeve. Spread the latter slightly so it slides snugly over the caster's own socket. Now solder clamp to sleeve at a right angle *(3)*. Illustration No. 4 shows how the caster is mounted to the torch.

With this attachment, the torch can slide within the clamp to meet any desired clearance between tip and wheel, and can turn on its own axis within the clamp for bevel cuts.



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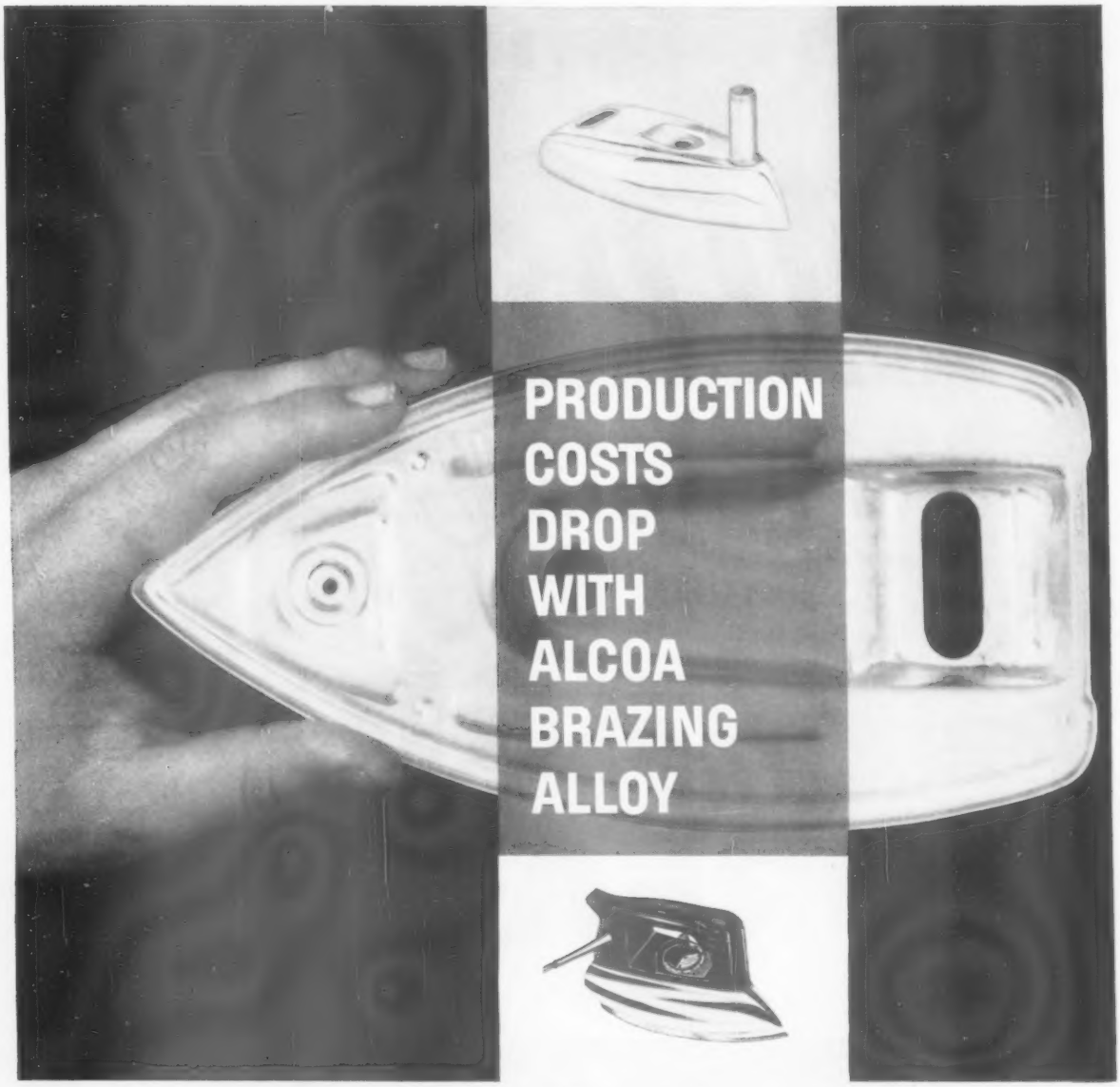
MUREX
MUREX PRODUCTS FOR BETTER WELDING



Customers get Better Steam Iron and Save $2

When Dominion Electric Company changed from silver-brazed brass to Alcoa® Aluminum in the manufacture of their steam iron tanks, they slashed material costs, simplified and speeded up production. The switch to aluminum and resultant savings in production costs meant an 11 per cent reduction in retail selling price and a better buy for the consumer's money.

To get these production savings, Dominion decided to assemble the tank by furnace brazing rather than welding. For the tank bottom, they used new alclad No. 100 Brazing Sheet with a special inner cladding of alloy 7072 to protect the core metal against penetration. No. 718 Brazing Alloy, in the form of shims or flattened wire, was used to join other parts of the tank assembly. Five components are furnace-brazed in *one single operation.*

Dominion's aluminum tank is equal in rigidity to stainless steel, more rigid than brass, yet weighs and costs only half as much as the other two materials. Hand application of filler metal and expensive chrome plating were eliminated in the switch to aluminum, and rejects are now few and far between. The new Dominion steam iron is lighter, heats faster, offers better protection against corrosion and tank perforation.

Alcoa is a never-ending source of *new and better* ways to weld, braze and solder aluminum. Write for FREE books and films on joining aluminum. Find out how aluminum can help you cut production costs and improve your product. For more information, contact one of the Alcoa distributors listed here, or write Aluminum Company of America, 1740-J Alcoa Building, Pittsburgh 19, Pennsylvania.

ALCOA ALUMINUM

Your Guide to the Best in Aluminum Value

"ALCOA THEATRE"
Exciting Adventure
Alternate Monday Evenings

Want technical help in welding, brazing or soldering aluminum? Contact your Alcoa sales office, listed under "Aluminum" in the Yellow Pages of your phone book.

For immediate delivery of Alcoa welding products, call your Alcoa outlet listed below. He carries a complete range of alloys and sizes.

ALABAMA
Birmingham
Hinkle Supply Co.

CALIFORNIA
Los Angeles
Ducommun Metals & Supply Co.
Pacific Metals Company, Ltd.
San Francisco
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COLORADO
Denver
Metal Goods Corp.

CONNECTICUT
Milford
Edgcomb Steel of New England, Inc.
Windsor
Whitehead Metal Products Co., Inc.

FLORIDA
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The J. M. Tull Metal & Supply Co., Inc.
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GEORGIA
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Southern Oxygen Co.

ILLINOIS
Chicago
Machinery & Welder Corp.
Steel Sales Corp.
Moline
Machinery & Welder Corp.

KENTUCKY
Louisville
Williams and Co., Inc.

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WEST VIRGINIA
Bluefield
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WISCONSIN
Milwaukee
Machinery & Welder Corp.
Steel Sales Corp.

ROOF shells are supported by columns through welding of steel in each.

Hurricanes can't topple this motel

Unit roofs are welded to columns

THIS YEAR'S roster of female-named hurricanes will meet stiff resistance from one Florida motel, thanks again to welding.

The $200,000, 20-unit motel at Warm Mineral Springs is a combination of concrete and steel, composed of roof slabs shaped like inverted umbrellas.

The upright columns are built on two levels, with every other one either several inches lower or higher than its adjacent column. These reinforced concrete supporting columns have their steel framework welded at the bottom to a steel plate below a foundation slab 10 in. thick and 2½-ft-square.

A steel hook is welded to the reinforcing steel. The latter spiders out to the corners of each 2-in.-thick roof slab, each of which is then welded to a column framework.

Two motor-generator welders, rated at 180 and 250 amp, were used for the job. Electrodes were an E6010 type in ⅛, 5/32 and 3/16 in. diameters. Oxyacetylene welding also was used on all the chilled water lines for the air conditioning units.

Pipes inserted down the center of the welded columns carry rainwater away to a central drainage system. The space between the slightly overlapping roof slabs is covered with a translucent plastic skylight.

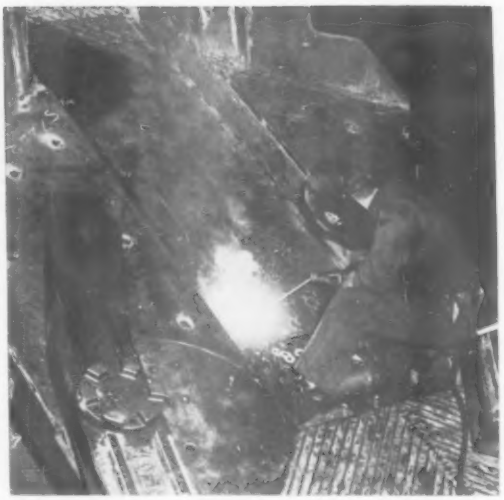
Since the 5-ton shells were cast at the job site, they had to be lifted from the molds within 48 to 72 hours, so they could be stored elsewhere for curing while further casting proceeded.

Cranes tied into the hooks welded at the apex of the 14½-ft-square shells moved them off the molds. After curing, each shell was again lifted, stabilized on top of a supporting column, and then welded.

Although not unique in architectural design, this manner of installation is entirely new in Florida.

LIFTING hooks and a steel plate inside the slab are welded to the steel of the supporting column. Perforated pipe carries rainwater away.

New alloy steel, welding processes aid mining machines



SEVERE abrasion on the gathering head and conveyor deck plates of this Joy ore Loader will be minimized by specially adapted alloy steel in two ways—bare and with hardfacing. Hardfacing increases wear resistance where gathering arms produce grinding action and where the conveyor rides over the hump.

ANOTHER TROUBLESOME, costly problem has been solved through the use of welding, flame cutting and hardfacing.

Long faced with the problem of reducing wear on mining machinery, a Pittsburgh manufacturer turned to the steel industry for the solution.

Jones and Laughlin Steel Corp., Pittsburgh, worked with the Joy Mfg. Co. to produce an economical method of reinforcing machine areas subject to extreme abrasion.

A special steel developed for surfaces where ore is in sliding contact with machines (Jalloy 3) was recommended. To reach maximum hardness, the steel, which has an intermediate carbon content, was heat treated in the range of 341 to 388 Brinell. It is readily welded with low-hydrogen ferritic electrodes. In thicknesses used, ¼ to ½ in., the steel does not have to be preheated.

After sheets are cut to size and welded into place, welded edges are finished with a powered hand grinder.

Tungsten-carbide hardfacing increases durability, hardness and wear resistance of the alloy when used in fabricating parts subject to extreme abrasion.

Weldability is an important factor in applying an all-over raised pattern of tungsten-carbide lines. These must be able to withstand grinding action of the fine ore under gathering arms of loaders and pressure of the conveyor chain as it passes over the hump.

Mining superintendents claim they have recorded an appreciable reduction in downtime and maintenance in mining machines, loaders and shuttle cars on which the abrasion-resistant steel is used.

Tempilstik° FOR ALL HEAT-DEPENDENT OPERATIONS

looks like a crayon... marks like a crayon... tells temperatures like a precision instrument!

Available in these Temperatures (F.)		
113	375	1000
125	388	1050
138	400	1100
150	413	1150
163	425	1200
175	438	1250
188	450	1300
200	463	1350
213	475	1400
225	488	1450
238	500	1500
250	525	1550
263	550	1600
275	600	1650
288	650	1700
300	700	1750
313	750	1800
325	800	1850
338	850	1900
350	900	1950
363	950	2000

Sixty-three different compositions enable you to determine and control working temperatures from 113° to 2000° F.

TEMPILSTIK° marks on workpiece "say when" by melting at stated temperatures — plus or minus 1%.

ALSO AVAILABLE IN LIQUID AND PELLET FORM . . . WRITE "WELDING SALES" DEPT. FOR SAMPLE TEMPIL° PELLETS . . . STATE TEMPERATURES OF INTEREST—PLEASE!

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Visit our booth #422 at the National Metal Exposition & Congress in the Cleveland Public Auditorium, October 27-31.

SAVE 80% OF SHIELDING GAS COSTS

If You Pay More Than 1½¢ Per ft. for Shielding Gas . . . You're Paying too Much!

A new all-CO_2 gas process by Liquid Carbonic saves approximately 7¢ on every foot of shielding gas used. Expensive argon or helium are entirely replaced by low-cost CO_2 in metal-arc gas shielded welding of carbon steels.

High quality, high speed welds

The new Liquid Carbonic all-CO_2 MAGS process (metal-arc gas shielded welding) produces welds which are equal or superior in both speed and quality to welds made with argon or helium shielding.

Adaptable to both hand and automatic equipment

Your present equipment can probably be used, either "as is" or with modifications. There is no extensive "change over" period with the new Liquid Carbonic all-CO_2 MAGS welding process.

Low cost multiplies the possibilities

By greatly reducing shielding gas costs, Liquid Carbonic's all-CO_2 MAGS process makes the many advantages of shielded gas welding available for even "low budget" applications.

A special welding grade CO_2 gas

CO_2 specifically manufactured for gas shielded welding has been developed by Liquid Carbonic. This gas is of the highest purity and packaged in specially marked 50 lb. (435 cu. ft.) cylinders. New Red Diamond Welding Grade CO_2 assures the highest possible metal-arc gas shielded welding performance.

World's Largest Producer of CO_2

LIQUID CARBONIC

DIVISION OF GENERAL DYNAMICS CORPORATION

Welding a pulley with Liquid Carbonic's new all-CO_2 MAGS process. In addition to cutting welding costs, new process virtually eliminates warpage because of reduced heat input.

Complete technical and operating data available

Write for your free copy of Liquid Carbonic's fact-filled new booklet on all-CO_2 metal-arc gas shielded welding.

MAIL THIS COUPON

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Please send me complete technical and operating data on Liquid Carbonic's new all-CO_2 process of metal-arc shielded welding.

Name_____

Title_____

Company_____

Address_____

City_____ Zone____ State_____

INTERNAL catalyst pipes are installed in the first Hortonclad vessel which was built in 1951 by Chicago Bridge & Iron Co. During a recent inspection, the welded, stainless-Monel-clad reactor showed only the usual microscopic pitting after being subject to a continuous bead type catalyst at 1,000 F for the seven years.

On the Job . . .

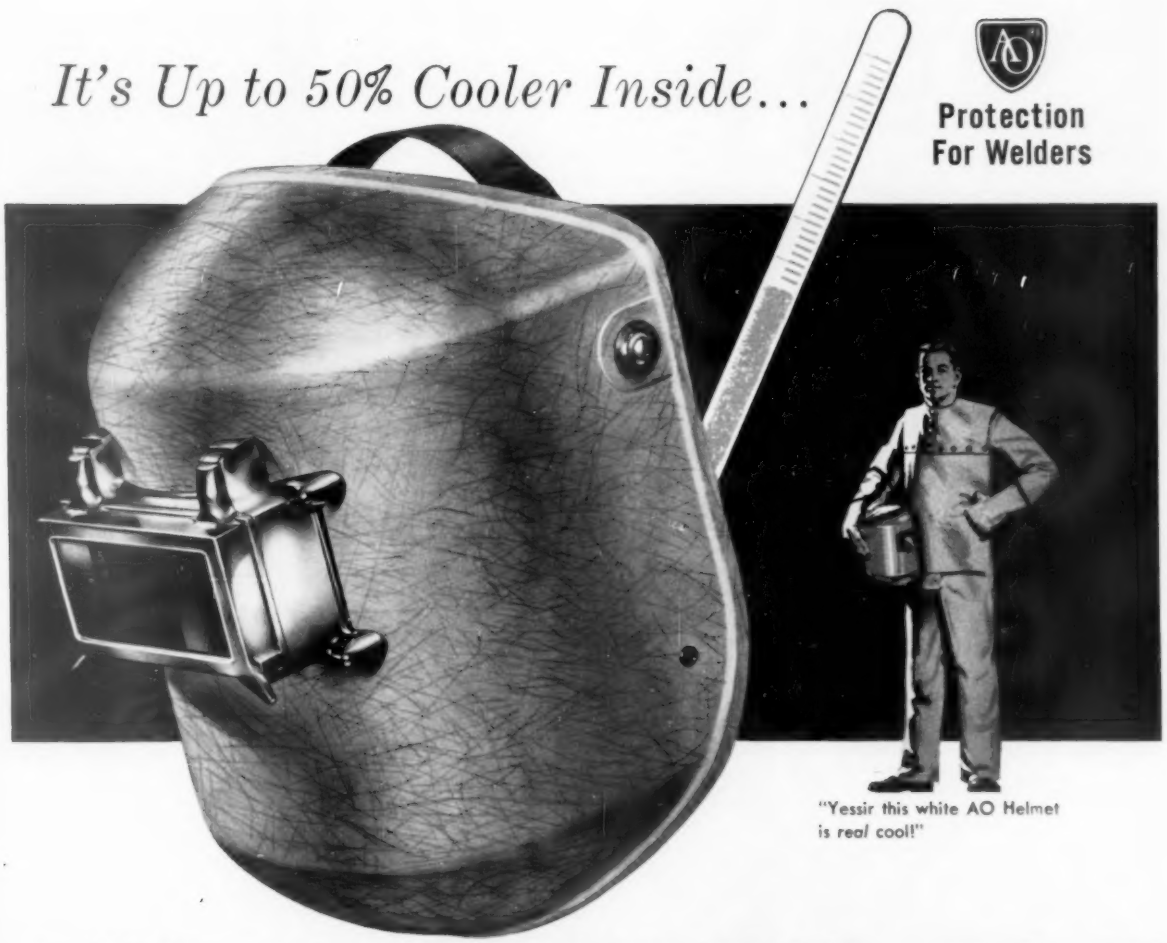
EXACT welding jig insures correct alignment and faster, safer welding of horizontal drawout metal-clad switchgear assemblies at Allis-Chalmers Manufacturing Co., Milwaukee. The new jig is reportedly designed to hold the assembly so rigidly that there is no distortion after welding.

METAL foil, half as thick as human hair, for aircraft and missile structural panels is formed and welded into strong, lightweight honeycomb core on a unique machine developed by Solar Aircraft Co., San Diego, Calif. Forming rollers to the right of the machine corrugate the metal strips, which are welded by one to four needle-like heads, layer by layer onto the circling loop of the completed core. The machine can make as many as 240 individual resistance welds each second.

ALUMINUM collector straps are Mig welded to new "K-Slab" cast aluminum bus bar being used at Kaiser Aluminum & Chemical Corp.'s Ravenswood, W. Va., reduction plant. More than 3 million lb of this bus bar have been installed to carry current to electrolytic pots on the plant's two potlines.

It's Up to 50% Cooler Inside...

Protection For Welders



"Yessir this white AO Helmet is *real* cool!"

A White AO WELD-COOL Welding Helmet!

(Reflects 70% of Radiant Heat)

This is the helmet *welders* have told us they wanted for years! And why not, when test after test shows that this helmet is 50% cooler inside.

Keeps the welder more comfortable — makes him more efficient. Another feature — the easy "radio dial" turning of adjustment knob to proper head size . . . and the AO 168AL aluminized plastic coverplate which provides additional coolness in the eye area. Inside of helmet is black to eliminate any possibility of diffusing harmful light rays and to permit easy cleaning. Helmet is particularly recommended for gas shielded arc welding. Also adaptable to outdoor welding because of the moisture resistance of its fiber glass construction.

No. 168AL CLEAR PLASTIC ALUMINIZED COVER PLATE

Highly reflective helmet cover plate. Reflects radiant heat — keeps welders cooler, more comfortable, more productive.

QUICK FACTS

- Fiber glass — nonwarping and moisture-proof, lightweight, strong.
- Flame resistant.
- Reflective, cool, aluminum glass holder — stationary or lift front.
- *New plastic* self-locking rear adjustment head-gear — Locks securely once set to proper head size.
- Excellent ventilation.
- Adjustable vulcanized fiber chin rest for easy alignment of helmet in line of vision.
- FOR WHITE EXTERIOR SHELL ASK FOR AO 9702-W or AO 9706-W. For dark gray shell ask for No. 9702 or No. 9706. (No. 9706-W illustrated.)

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COMPANY
SAFETY PRODUCTS DIVISION

Always Insist on AO Trademarked Safety Products
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YOUR BEST MOVE . . . MOVE
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MATERIAL
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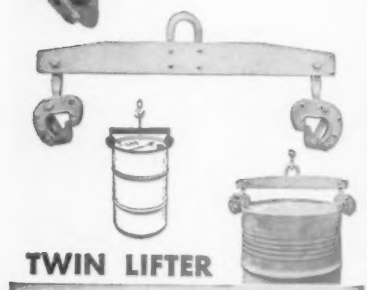


For Interesting Information write

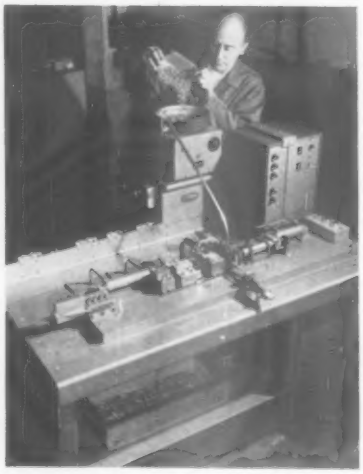
MERRILL BROTHERS

56-81 Arnold Ave., Maspeth, N. Y

NEW PRODUCTS . . . USE CARD ON PAGE 89

STIFFENERS are stud welded to larger pieces of stainless steel to eliminate the bow in thinner-gage sheets used for fabrication of kitchen and restaurant equipment. Welder offered by Graham Manufacturing Corp., Needham, Mass., has added advantage of not burning opposite surface, eliminating grinding and polishing after welding. Self-contained portable unit operates from 110 volts, a-c, with draw of less than 10 amp.

Circle No. 1



Automated welder

AUTOMATIC assembly and welding machine for electronic components production turns out 3,000 precision-welded "pigtail" assemblies per hour. Fully automatic, the lead wire is fed from a reel to welding position, straightened, and cut accurately to exact length by a guillotine cut-off. Cups are fed from a vibratory hopper to welding position. Machine can handle wire from 0.025 to 0.050 in. *Raytheon Mfg. Co.*

Circle No. 2

Automatic welding equipment

AUTOPAK automatic welding equipment can be used as a manual welder and can be extended to any fully-automatic application. Can also be used in hand welding with ordinary coated electrodes. The control unit and the welding circuit contactor panel are the only control items. Special drive provides a 25 to 1 continuous speed variation. Welding head has been designed to take continuous wire feed when powered by the Autopak transformer. Intended mainly for submerged-arc welding. *Rockweld Co.*

Circle No. 3

Copper-base alloy

DESIGNED primarily for brass, copper-base alloy is triple-deoxidized and silver bearing. EutecRod 1808 can be applied either thin flowing or bead-forming. Applications include use in electrical, architectural, jewelry, refrigeration and pump industries. Alloy melts at 1,550 F. Also suitable for steel, cast iron and nickel alloys. *Eutectic Welding Alloys Corp.*

Circle No. 4

Control valves

SPEED KING, ¼-in., 4-way foot mounted remote-operated control valve is said to be suited for use in hazardous locations and wherever remote pilot operation is desired on any pneumatically-interlocked circuitry. Service life is said to exceed 25 million cycles. Cylinder ports and inlet are tapped ¼ in. NPT, exhaust is tapped ⅜ in. NPT. Single and double type valves are designed for 35-250 psi air and oil service, with double valves controlling vacuum down to 1 in. Hg less than absolute. Valves are also available for other fluids and pressures. *Valvair Corp.*

Circle No. 5

Welder power plant

A 3-IN-1 combination a-c/d-c welder and a-c power plant is designed for metal-arc use. The DA-300 Big Rig has 1 kw of d-c power while welding, and generator output is rated at 10 kw of 115/230 volts, single phase, 60 cycle a-c. Welding ranges in amp are: (d-c) 75-175 or 125-350; (a-c) 65-160 or 110-400. Rated output at 100% duty cycle: 250 amp d-c at 40 volts and 300 amp a-c at 40 volts. *Miller Electric Mfg. Co.*

Circle No. 6

Grinding wheels

THERMO-CUT grinding wheels and abrasive products are now being offered to welding distributors. *Thermacote Co.*

Circle No. 7

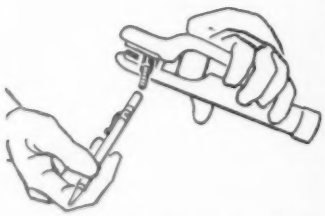
NO ELECTRICAL CONTACT TAKES MORE ABUSE THAN YOUR ELECTRODE HOLDER JAWS

Clean Jaws Save Time and Money

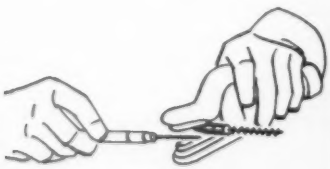
New "Jaw Cleaner"

JAW CORROSION AND DIRT BUILD RESISTANCE

1. Cuts speed of welding by cutting flow of power.
2. Causes arcing between bare end of rod and jaws, pitting jaws and building up heat.
3. Causes heating of rod, splitting of coating and throwing away long stubs.
4. Builds up heat in Holder, resulting in down-time for cooling. **Clean jaws cut holder temperature as much as 50°.**
5. Every welder should carry an ATLAS **"Jaw-Cleaner".**



Insert tapered end of brush to hold jaws open. Pull handle away.



Reverse broach in handle. Clean contact surfaces and sides of jaws.

Now cock jaws open with tapered end of broach and use brush for final polishing.

1. CLEANING BROACH

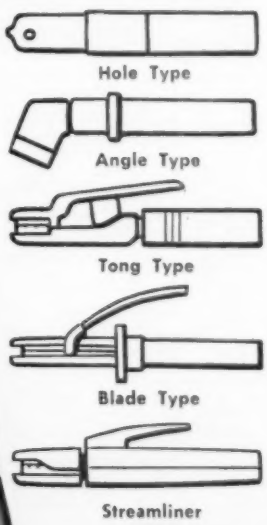
Cleans corrosion, spatter and dirt off Jaws. Does not cut away metal. Double teeth clean in both directions.

2. POLISHING BRUSH

Spiral wire type with long life. Finishes the job with a like-new polish and perfect contact surface.

SUGGESTED LIST PRICES		
1-5	6-23	24-71
$2.50	**$2.25**	**$2.13**
72-143	144-UP	
$2.00	**$1.88**	

FOR ANY HOLDER



Start getting better holder performance— Clean jaws save money

ATLAS
WELDING ACCESSORIES INCORPORATED
707 E. LEWISTON
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NO PREHEAT NO POSTHEAT

on

HIGH TENSILE STEEL

when you weld with

AIRCO 394

* Airco 394 all-position electrodes overcome underbead cracking in welding of most hardenable steels — without preheat.
* Make possible high quality hardenable steel welds without postheat.
* Weld steels of 30% or more carbon.
* Recommended wherever steels contain both alloying elements and high carbon.

* * *

Airco 394 electrodes produce a manganese molybdenum deposit of low hydrogen content. Weld metal is of high strength. Arc action is steady, beads are smooth, slag removal is easy.

FREE — Send for the handy Airco Electrode Guide. It will help you select the right electrode for your specific job Request catalog 1318.

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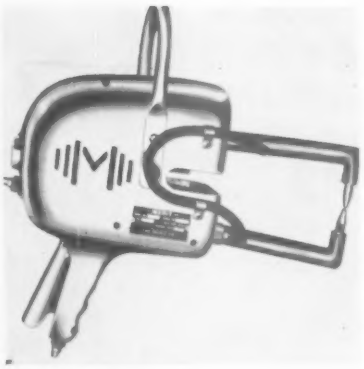


Spot welder

DESIGNED for portable or pedestal operation, new spot welder includes an automatic timer and contactor, a welding capacity up to 3/16 in. combined thickness of a variety of metals, and a linkage device that permits variable tip pressure from 0 to 1,000 lb. Applicable to steel, most aluminum alloys, brass, cadmium plated, galvanized steel and other related metals. The unit is available in air or water cooled models, both 85/8 by 18½ in., weighing 28 lb. *Merit Co.*

Circle No. 8

Welding clamps

DESIGNED for hard to get at surfaces, Swing-Wel clamp can be moved out of way by rotating it on its axis. Spindles permit 3½-in. thrust, eliminating necessity for shims or other filling material. Includes wingnut handles, and is surface treated to prevent spatter adhesion. Styles come with opening from 8 to 48 in. *Wetzler Clamp Co.*

Circle No. 9

Stainless weld wire

COMPANY has new line of bare stainless steel welding wire, plus additions to line of automatic hardfacing electrodes. Wire comes in coils, spools and cut lengths. The electrodes come in 19 manual types and seven tube type wires for semiautomatic and automatic applications. *A. O. Smith Corp.*

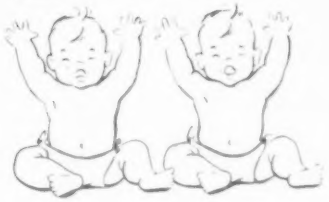
Circle No. 10

Weld gage

FILLET Weld Gage, designed to measure concave and convex welds, measures the nine most popular weld sizes—from ¼-in. to 1-in. Pocket-size and weighing only 3 1/3 oz, gage comes in a plastic case. *Fibre-Metal Products Co.*

Circle No. 11

YOU GOTTA KEEP 'EM DRY!



Moisture "messes up" electrodes, too, cuts welding profits.

End costly reworks by drying rods in

DryRod® OVEN

Mineral coated electrodes are *thirsty*. The instant you unpack them they start soaking up moisture . . . within 2 hours often as much as 13 times US allowable specifications. Moist rods cause porosity, under-bead cracking, rough welds, etc. Rod scrap runs high. Production slows down. Reworks eat up profits.

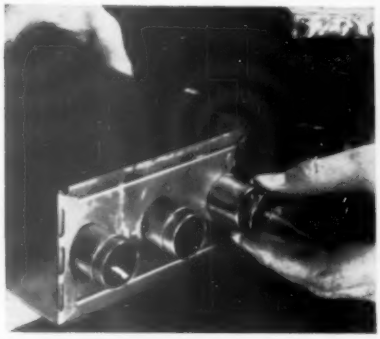
Storing rods in DRY-ROD OVEN prevents such losses, insures faster, finer workmanship at less cost.

Write for new literature on latest rod-drying methods, "Dry Rod as Standard Welding Equipment."

PHOENIX PRODUCTS COMPANY

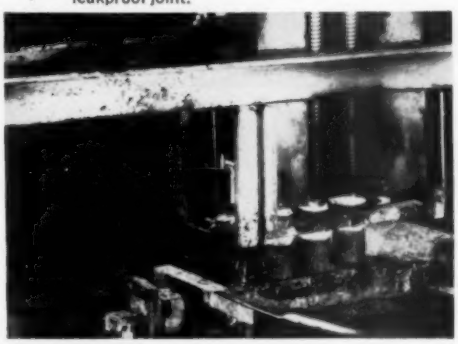
4727 N. 27th St. • Milwaukee 9, Wis.

1 EASY-FLO preform ring is slid over header tubes.



2 Operator fluxes bank of assemblies prior to heating.

3 Assembly is heated by gas-air burners; heating time: 50 seconds. Note capillary action of alloy; thorough penetration makes strong, leakproof joint.



4 Components of header box; ring is preplaced.

5 Header box under heat; time: 46 seconds.

6 Brazed unit. Note neat, clean fillet around base of tube fitting.

Embassy Steel Products **Cut Unit Labor Cost 50 Per Cent with Handy & Harman Silver Brazing**

START WITH BULLETIN 20

It tells you why and how high speed, strength and economy are inherent in silver alloy brazing. Gives information on joint design and brazing methods. A copy is yours for the asking.

Before Handy & Harman Silver Alloy Brazing came into Embassy Steel Products' production picture, these convector radiators were welded. Now, they are brazed with EASY-FLO 35 *using gas-air heat, and unit labor cost has been cut by 50 per cent. This includes cleaning, fluxing and assembling. Not bad, eh?*

Components involved in this big saving are cold-rolled steel header plates that are brazed to fin tubes and cold-rolled steel header boxes that are brazed to steel fittings. Both of these convector assemblies are used in residential heating units.

Preformed EASY-FLO .047 wire (.015 ID) is used for brazing the header plate and fins. Photographs describe the joining steps. Each assembly goes through a 50-second heating cycle.

The header box is made in three sizes – depending on the size of the coil assembly it fits. Average heating time for any size is 46 seconds. Two sizes of EASY-FLO are used: .047 and .062 wire. Switching from one size to another involves no change in assembly or heating setup. Add this to brazing's long list of production benefits and *subtract* it from production costs.

If all we had to talk about in this case was the reduction in production time because of brazing, we'd still have a strong story to tell. You'll notice that we've said nothing about joint strength, alloy cost, corrosion resistance, ductility and so on. We can, and if you'd like to know how these benefits can apply to what you're joining right now, all you have to do is ask us. We'll be happy to tell you.

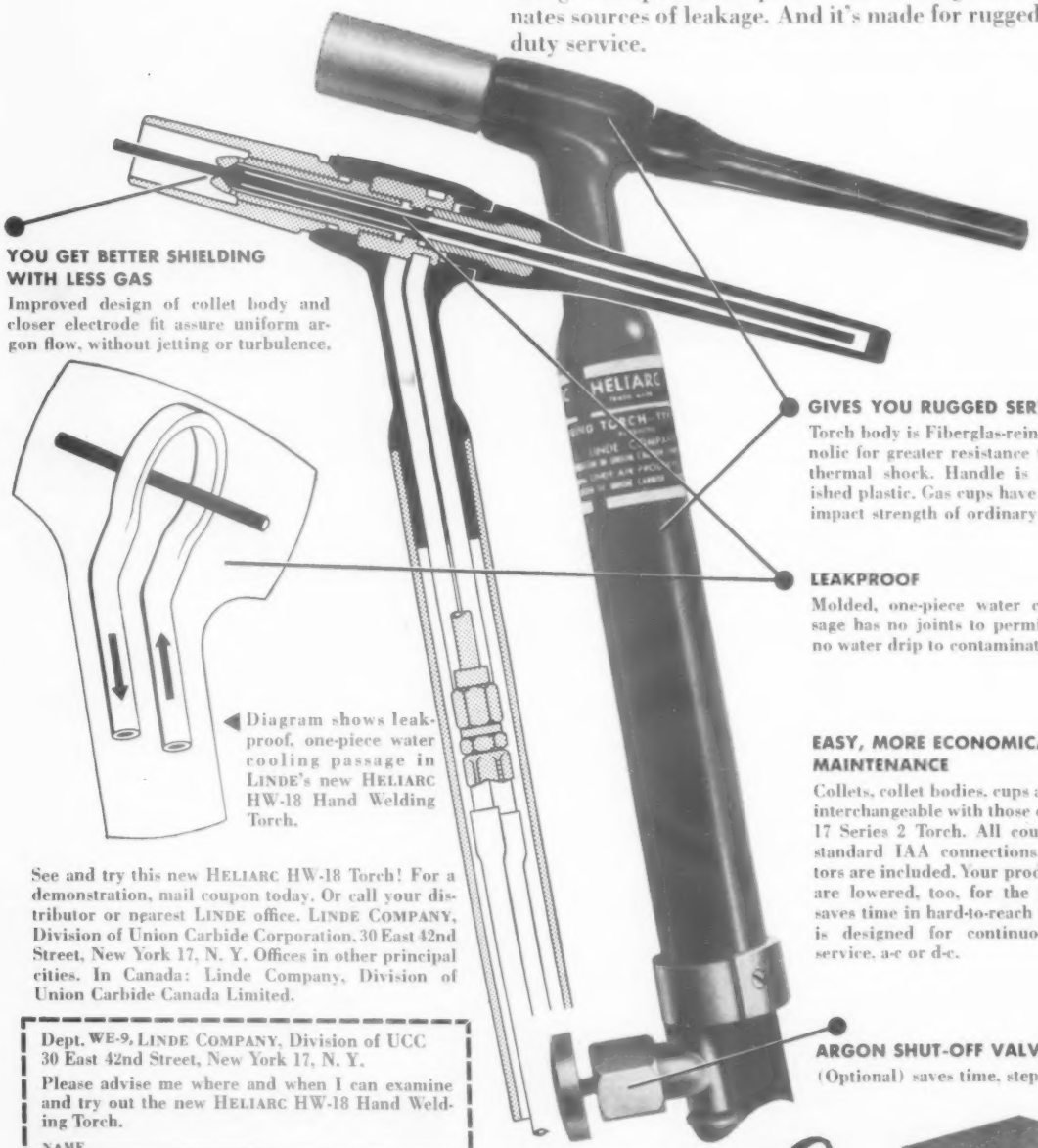
Your No. 1 SOURCE OF SUPPLY AND AUTHORITY ON BRAZING ALLOYS

HANDY & HARMAN
QUALITY SERVICE

HANDY & HARMAN
General Offices:
82 Fulton Street, New York 38, N. Y.
Distributors in Principal Cities

Here's a NEW WELDING TORCH that's WATERTIGHT... built for HEAVY-DUTY SERVICE ...yet weighs only 7 OUNCES!

This new HELIARC HW-18 Hand Welding Torch weighs only 7 ounces, making it easy for you to handle, less tiring. The special one-piece water cooling channel eliminates sources of leakage. And it's made for rugged, heavy-duty service.



YOU GET BETTER SHIELDING WITH LESS GAS

Improved design of collet body and closer electrode fit assure uniform argon flow, without jetting or turbulence.

GIVES YOU RUGGED SERVICE

Torch body is Fiberglas-reinforced phenolic for greater resistance to heat and thermal shock. Handle is tough, polished plastic. Gas cups have 4 times the impact strength of ordinary cups.

LEAKPROOF

Molded, one-piece water cooling passage has no joints to permit leakage—no water drip to contaminate welds.

◀ Diagram shows leakproof, one-piece water cooling passage in LINDE's new HELIARC HW-18 Hand Welding Torch.

EASY, MORE ECONOMICAL MAINTENANCE

Collets, collet bodies, cups and caps are interchangeable with those of your HW-17 Series 2 Torch. All couplings have standard IAA connections, and adaptors are included. Your production costs are lowered, too, for the new HW-18 saves time in hard-to-reach spots. Torch is designed for continuous 300-amp service, a-c or d-c.

ARGON SHUT-OFF VALVE

(Optional) saves time, steps and argon.

See and try this new HELIARC HW-18 Torch! For a demonstration, mail coupon today. Or call your distributor or nearest LINDE office. LINDE COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y. Offices in other principal cities. In Canada: Linde Company, Division of Union Carbide Canada Limited.

Dept. WE-9, LINDE COMPANY, Division of UCC
30 East 42nd Street, New York 17, N. Y.

Please advise me where and when I can examine and try out the new HELIARC HW-18 Hand Welding Torch.

NAME _____

COMPANY _____

STREET _____

CITY _____ ZONE _____ STATE _____

FOR THE BEST IN ELECTRIC WELDING LOOK TO Linde TRADE MARK

UNION CARBIDE

The terms "Linde," "Heliarc," and "Union Carbide" are registered trade-marks of Union Carbide Corporation.

Liquid flux

ORGANIC liquid flux with residue guaranteed to be inert and corrosion-free has been developed for soldering copper alloys and tinned metals. Flameless heating methods are best with new development, says firm. It is suited for solders melting below 500 F. Used for general purpose wiring, sealing and tinning leads. *Eutectic Welding Alloys Corp.*

Circle No. 12

Hand trucks

ALL-WELDED, lightweight hand trucks for handling medical oxygen come in three new styles. Cylinders are held in place by spring loaded steel chain. Models having one or two ball bearing rear wheels feature ability to lock wheels up out of the way when not needed. *Harper Steel and Supply, Inc.*

Circle No. 13

Hardness tester

EXCLUSIVE distributor in U.S. for English-made "Penetrascope" portable hardness tester is Steel City Testing Machines, Inc., Detroit. Tester performs a diamond pyramid hardness test. It weighs about 18 lb, and is especially useful in testing finished parts, firm says. Tests wide range of materials, from thin metal strips to large mill rolls or cylinders. All models finished in polychrome and equipped with mahogany carry case. *Steel City Testing Machines, Inc.*

Circle No. 14

Ceramic tooling

PLATES and boats fabricated from "Sur Braze S-2" casting ceramic are used for critical sintering operations on metals, ferrites, ceramics and glass at temperatures of 3,000 F. The plates and boats

have 1) purity of material, so tooling will not contaminate powders being sintered, 2) heat resistance to temperatures up to 3,000 F and 3) extreme resistance to thermal shock. *Duramic Products, Inc.*

Circle No. 15

Bleed-off valve

AIR Bleed-Off Valve is designed to automatically eliminate air in hydraulic circuits under pressures up to 5,000 psi. The valve is 2⅜ by 1 in. It is also available with ¼ in.-NPT or 9/16-18 in. straight threads. *Denison Engineering Div.*

Circle No. 16

Safety glasses

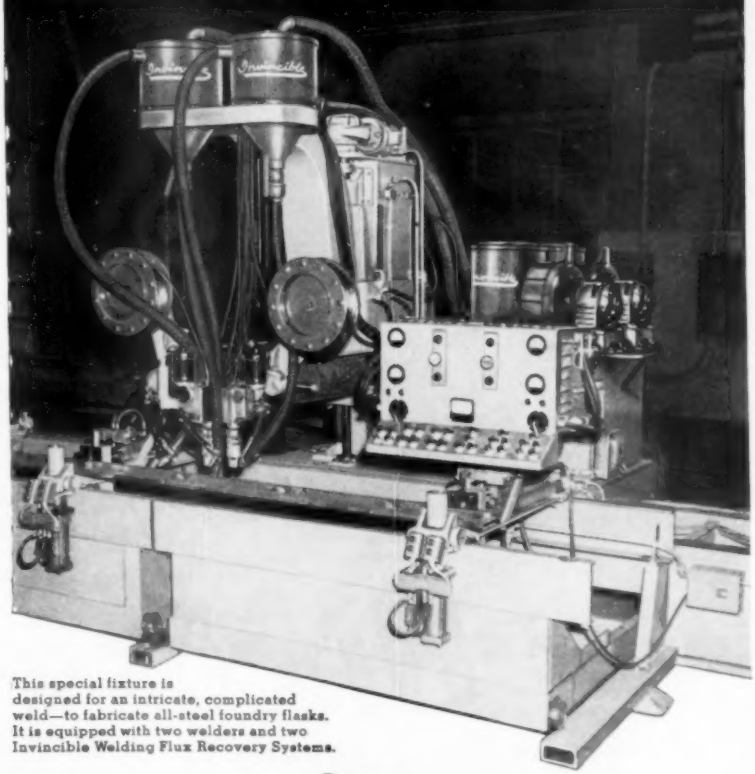
NEW line of safety glasses includes a multi-fit bridge that is claimed to fit more than 90% of all employees. Firm says special design also overcomes tendency of safety glasses to slip down on the nose. *Fendall Co.*

Circle No. 17

Welding Fixture and Positioner Manufacturers Specify . . .

INVINCIBLE

WELDING FLUX RECOVERY SYSTEMS



This special fixture is designed for an intricate, complicated weld—to fabricate all-steel foundry flasks. It is equipped with two welders and two Invincible Welding Flux Recovery Systems.

Because:

- INVINCIBLES recover *all* unfused flux on submerged arc welding jobs, remove powder and return slag-free, dust-free flux to the welder in a *continuous* flow. Savings in reclaimed flux *alone* repay their cost in a few months, or even weeks. And they save costly man-hours over manual methods, speed production, minimize costly rejects by eliminating flux flour.
- INVINCIBLES are available in 14 standard automatic and manual models from 1½ to 7½ horsepower *plus* special machines and combinations. All feature compactness, flexibility and rugged construction.
- INVINCIBLE's resident engineers in all principal cities will assist you in achieving maximum savings from submerged arc welding operations.

SEND FOR FOLDER on Invincible Flux Recovery Systems

INVINCIBLE VACUUM CLEANER MFG. CO.
DOVER, OHIO

OVER 50 YEARS THE LEADER IN INDUSTRIAL VACUUM EQUIPMENT

When corrosion is a threat to the life of Stainless Welds

Job report courtesy of
Superior Welding Co., Decatur, Ill.

WELD WITH ARCOS

STAINLESS ELECTRODES

This is a nitric acid absorption column for the chemical industry. The shell and flanges of solid 304 ELC stainless were welded with Arcos CHROMEND 19-9 Cb Electrodes to resist chemical attack at 150 p.s.i.g. and 300°F. Arcos CHROMEND K-LC Electrodes were used for welding the bubble caps and coil clips. Together, these two Arcos Electrodes proved the point: there's no substitute for quality weld metal when long uninterrupted service is essential. ARCOS CORPORATION, 1500 South 50th Street, Philadelphia 43, Pa.

Cleaning tool

JAW Cleaner contributes to better and faster arc welding, says firm. It consists of a hardened steel broach and spiral wire brush. Used to clean corrosion, spatter and dirt from electrode jaws without cutting away the metal. It polishes jaws so that a perfect electric contact is maintained. *Atlas Welding Accessories, Inc.*

Circle No. 28

Control valve

PILOT-operated air control valve is mounted directly on cylinder of portable weld gun. Gives faster gun response, manufacturer says. Valve kit includes aluminum manifold adapter on gun cylinder. Boss on valve body is for attaching welder handle. Uses standard solenoid coil for a-c or d-c, any voltage. *Valvair Corp.*

Circle No. 29

Cable cover

NEOPRENE cover for cable connection is electrically safe, crush-proof and tapered to fit snugly around cable jacket. Prevents connector from snagging when being dragged around field or shop. *Tweco Products, Inc.*

Circle No. 30

Chipping hammer

MANUFACTURER claims four advantages for chipping hammer: (1.) absorbs chisel vibration; (2.) provides new comfort and efficiency for operator; (3.) substantially reduces noise level; and (4.) eliminates breakage of parts caused by improper operation. Each hammer size has four power sizes. A particular size hammer can be converted to any one of the four power ratings by changing valve box cap. *Ingersoll-Rand Co.*

Circle No. 41

CIRC-O-THERM oven, by Hevi-duty Electric Co., Milwaukee, features circle of heat design that assures uniform heat throughout chamber, says manufacturer. Operates on either 115 or 230 volt a-c, with temperatures to 250 C. Has three perforated aluminum shelves.

Circle No. 31

Portable cutting outfit

SAVALIFE kit, a portable emergency cutting outfit for use by rescue squads has a heavy duty torch and an inhalator that delivers up to 6 liters of pure oxygen. Housed in a spot-welded aluminum case, kit weighs 46 lb, measures 26 in. high, and 15 in. by 7 in. It can cut up to $1\frac{1}{2}$ in. of steel for two hours, and has a spare gas cylinder for additional cutting. Kit drawer holds goggles, gloves, spark lighter, wrench, spare tip, inhalator and instruction book. Meets, and exceeds, civil defense specifications, firm says. *Gas Arc Supply.*

Circle No. 23

Butt-welder

CLAIMED to be the fastest-operating butt welder built, new air-operated Model BW makes up to 2,500 welds per hour in semi-automatic operation. Equipped with air regulator, gage, automatic timer, filter cleaning unit. Best for wire rings, rectangulars, flats and angles. *Alphil Spot Welder Mfg. Corp.*

Circle No. 24

Hardfacing electrode

COMPOSITE-COATED hardfacing nickel-manganese electrode, whose deposits are very tough in low temperatures, provides good wear and impact resistance. Walmang No. 3 can be used on a-c or d-c reverse polarity. Company recommends it for hardfacing manganese and carbon steel castings or forgings of all kinds. Deposits at 229 BHN, work hardens as high as 555 BHN. *Wall Colmonoy Corp.*

Circle No. 25

Water flow control

WATER MIZER allows cooling water to flow in proportion to machine load. It is designed for use on resistance welders, induction heaters, or any internally operated water cooled equipment. Designed so control panel can be mounted inside machine or control panel. *Van Vooren Products.*

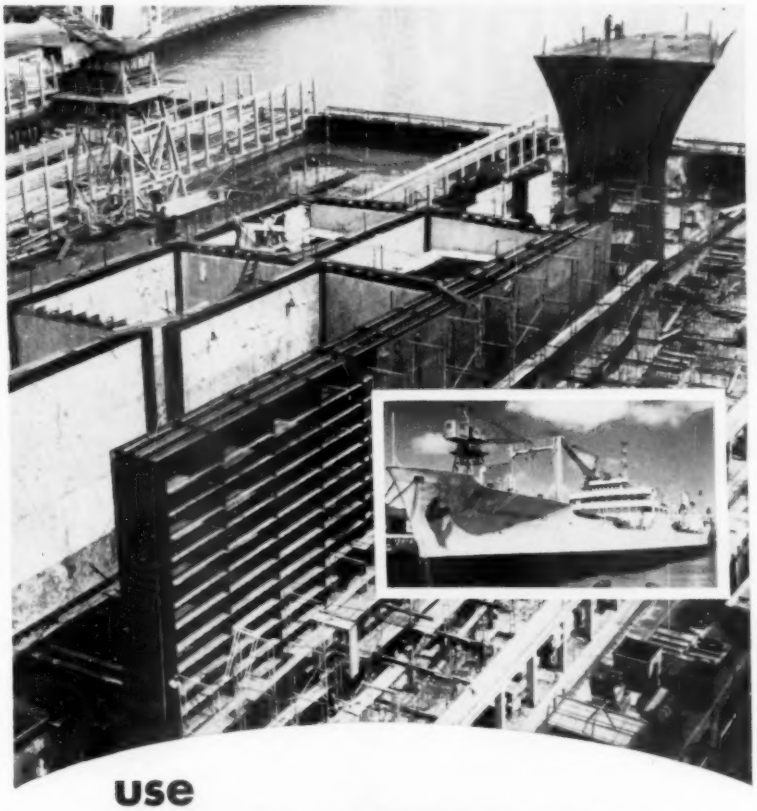
Circle No. 26

Stain remover

CHEMCLEAN 536 is a colorless liquid, acid in nature, developed for the removal of burns and stains on stainless steel caused by welding. Manufacturer claims it is extremely effective on the 300 series of stainless steel. Brightens steel as it cleans. *Chemclean Products Corp.*

Circle No. 27

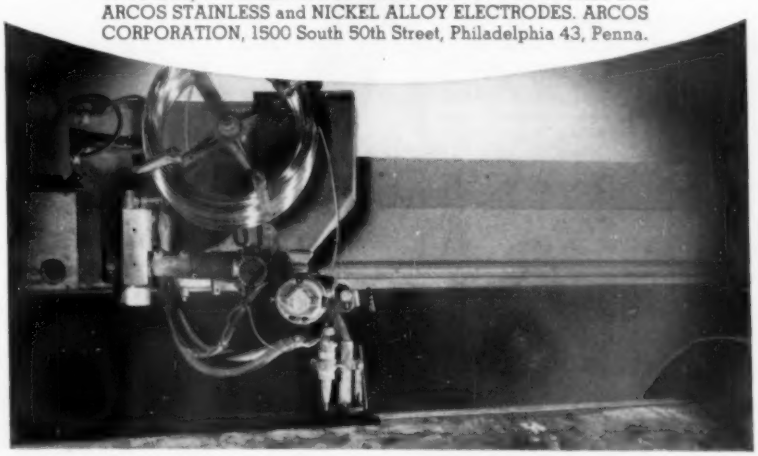
When submerged arc welding requirements are HIGHLY UNUSUAL!



use

ARCOSITE BONDED FLUX

The SS Angelo Petri—the first of its kind—is a new wine tanker carrying 26 welded cargo tanks with a 2 million gallon bulk capacity. Especially unusual was the use of submerged arc welding on both sides of the type 316 stainless-clad steel tanks. ARCOSITE C-17 FLUX and Arcos CHROMENAR 25/20 bare wire were used to assure proper physical, corrosion resistant properties, and joint soundness. To control dilution on the stainless side, the clad side was automatically gouged slightly by carbon arc. Another unusual achievement tending to retard corrosion was the cathodic—rather than anodic quality of the submerged arc welds. Write today for information on ARCOSITE BONDED FLUXES and ARCOS STAINLESS and NICKEL ALLOY ELECTRODES. ARCOS CORPORATION, 1500 South 50th Street, Philadelphia 43, Penna.

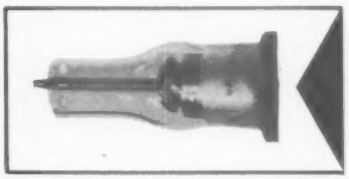


NOTHING EVEN COMES CLOSE

TO THE AMAZING

TEC VISUWELD® TORCH!

The TEC VISUWELD water cooled torch is the talk of the Industry because it's the ONLY torch to combine ALL these exclusive features for outstanding TUNGSTEN INERT GAS WELDING.

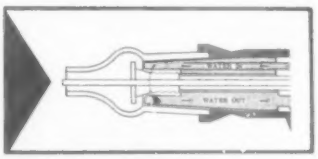


ORIGINAL VISUWELD TRANSPARENT GAS NOZZLE . . . YOU SEE WHAT YOU WELD!

An unrestricted view of the weld while welding with durable, fog-free Quartz, Vycor or Pyrex nozzles.

EXCLUSIVE "TIP-OF-TORCH" COOLING FOR COOLER OPERATION! . . .

Cooling system design affords continuous coolant water to reach tip of the torch. No need for "cooling off time" even at 350 amps.



PLUS THESE AND OTHER FEATURES:

GUARANTEED GAS AND WATER LEAKPROOF! . . .

One-piece unit torch head with NO fittings or gaskets allowing NO water or gas to escape.

LIGHTEST WEIGHT TORCH... ONLY 3 OUNCES!

Three ounces of working weight and an inch of diameter mean easy handling, faster fatigue-free operation.

3 TORCHES IN ONE! . . .

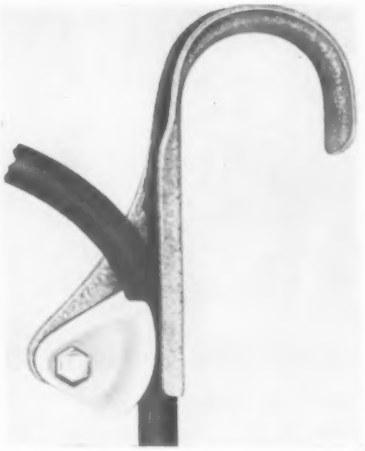
Weld efficiently, continuously from 3 to 350 Amps. . . . AC or DC. No need to change torches.

NO MAINTENANCE PROBLEMS! . . .

One-piece construction coupled with durable materials eliminate parts wearing out. No replacements are required.

Write NOW for full information on the TEC Visuweld Torch and Other Superior Visuweld Equipment

TEC TORCH CO., INC. 300 PATERSON AVENUE CARLSTADT, NEW JERSEY



Cable holder

CABLE holder that is safe and efficient is hooked to a support near the work area and allows cable to be pulled through, but does not allow it to slip back. Firm says Cablehitch is useful in shop fabrication of large weldments because it can hold cable from above and allow the weldor to move about without cable drag. *Jackson Products.*

Circle No. 18

Aluminum cleaner

LIQUID brushed on aluminum prior to welding cleans and deodorizes surface in one operation. Small parts are treated by dipping in liquid and flushing with water. Leaves surface free of organic contaminants and surface oxides and low in electrical resistance. *Clarkson Laboratories, Inc.*

Circle No. 19

Warning signs

Two new aluminum signs are for anyone in industry or medicine who uses radioactive isotopes in a large enough quantity to expose personnel to appreciable levels of radiation. Signs meet AEC recommendations governing radiation warning signs. Both contain the radiation caution symbol, color and words prescribed by AEC regulations. *Picker X-Ray Corp.*

Circle No. 20

Coated finishing paper

USABLE as a dry sanding product that does not require a water lubricant, No-Load paper has a special coating on the abrasive side of paper that prevents residue from loading or clogging abrasive grains. Can be used on metal, non-ferrous metal and aluminum as well as non-metallic materials. Produced in 9 by 11 in. sheets and discs cut from the sheets. *Armour and Co.*

Circle No. 21

Safety glasses

THREE styles of plastic-frame, square-lens flash and grinding safety glasses are designed for protection from frontal hazards and afford side protection from flying particles. Glasses come in clear or green lens with or without side shields. *Glendale Optical Co., Inc.*

Circle No. 22

Vapor thyratron

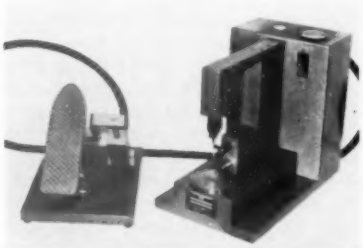
ARGON-mercury tube with lug base and spade terminals makes positive contact and eliminates socket heating and associated troubles, firm says. Ratings are: filament volts, 2.5; filament current, 9 amp; anode current, 2.5 amp; peak anode current, 30 amp; peak inverse and forward volts, 1,500. *National Electronics, Inc.*

Circle No. 32

Cage assembly

WELDING area is increased with new steel cage assembly designed to hold and protect semi-automatic welding control and wire feed units. Also offers flexibility in welding operations, firm says. Cage can be raised, lowered and moved to any welding position. Cage assembly is of ½-in. steel rod and tubing, and measures 26½ by 16 in. at base, 24 in. high. Plywood base, reinforced with angle-iron frame, is ⅜ in., providing insulation to prevent possible electrical shorting. *National Cylinder Gas Div.*

Circle No. 33



Weld head

HEAVY-duty hydraulic weld head (model VTA-17) is designed for use with resistance-type and capacitance discharge-type welders where measured pressure is desired. An automatic weld pressure firing switch mounted on the head allows exact adjustment of firing pressure from 0.5 to 100 lb. Unit is self-contained, portable. Head design allows wide variety of electro setups, including 3½ in. diameter copper electrode bottom plate for jig and fixture contactor surface. *Vacuum Tube Products Co.*

Circle No. 34

Reflectoscope

PORTABLE reflectoscope designed to operate at 2.25 mc weighs only 35 lb and measures 9 in. wide, 19 in. deep and 14 in. high. Simplified operation, bright picture and easily read video trace facilitate field work. Ultrasonic inspection of welds, studs, pipe, etc., is possible with instrument. *Sperry Products, Inc.*

Circle No. 35

Aluminum electrodes

ALUMINUM electrodes (one when 5% silicon is involved and another for pure aluminum) for flat and vertical welding on cast, drawn and sheet aluminum eliminates moisture problems, manufacturer says. They are for use only on d-c reverse polarity. A long shelf life because of special compounding of flux coating and plastic bag packaging is claimed. *All-State Welding Alloys Co.*

Circle No. 36

GB 88 FLUX.. *available in 3 oz., ½ lb., 1 lb., 5 lb. jars and 25 lb. drums to suit your needs*

Use GB 88 Flux, the flux of proven dependability and note the improvement in the quality of your Silver Brazing. GB 88 is fully active to 1650°F.

Low glare and low fuming characteristics insure operator comfort and quality results. It is stable in use as well as in storage and was developed for Silver Brazing of STEEL, BRASS, COPPER, STAINLESS STEEL, MONEL, NICKEL, INCONEL, CHROME ALLOYS, SILVER and GOLD.

For best results team up GB 88 Flux with GB Silver Brazing Alloy in the form or size you require: random coils (all diameters), strip, straight lengths, pre-formed rings and special shapes. Prompt service on all inquiries.

90th ANNIVERSARY

Goldsmith Bros.
SMELTING & REFINING CO.

111 N. Wabash Ave., Chicago 2, Ill. • 74 W. 46th St., New York 36, N. Y.
OAKLAND

Mail Coupon for your FREE copy of the GB Data Book—complete information on low temperature Silver Brazing

PLEASE SEND GB Data Book without obligation.

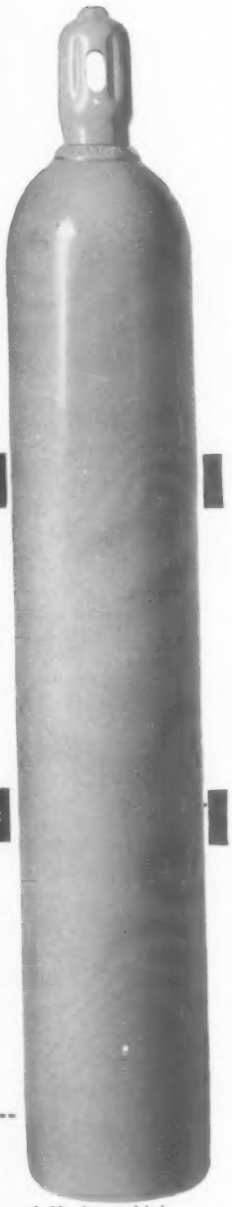
Name_____

Address_____

City_____ State_____

Hackney MILWAUKEE

lightweight cold drawn cylinders for oxygen and other high pressure gases



Hackney gives you everything you want in high pressure gas cylinders—light weight, safety, minimum maintenance, long life—because the *Hackney* cold drawn process eliminates excess material and results in lighter weight, ruggedly built cylinders.

HACKNEY FEATURES INCLUDE:

- maximum strength without needless weight
- light weight—easier to handle
- uniform sidewall thickness, weight—top to bottom, side to side
- uniform cylinder capacity—simplifies filling
- smooth surfaces—free from crevices, ridges
- exceeding all ICC requirements for cylinders
- shapes and sizes for all service requirements—from small medicals to 220's and 250's (cu. ft.) for oxygen, hydrogen, nitrogen, helium, argon and carbon dioxide

WHEN YOU BUY HACKNEY CYLINDERS, YOU:

- save money on shipping costs every time you ship cylinders
- reduce handling costs—minimum manpower needed
- cut maintenance costs—smooth surfaces easily cleaned and painted
- can have personal markings on cylinder and neck ring

for complete details, mail the coupon!

Pressed Steel Tank Company
1456 S. 66th St.
Milwaukee 14, Wis.

Gentlemen: We are interested in detailed facts and prices of Hackney high pressure gas cylinders in (sizes).....; in the quantities 1 to 24 ....., 25 to 99....., 100 to 499....., 500 to 999....., 1000 or more.....

Firm name.....

Your name.....

Address.....

City.....*State*.....

Pressed Steel Tank Company

Manufacturer of Hackney Products since 1902

1456 South 66th Street, Milwaukee 14, Wis.

Branches in principal cities

CONTAINERS AND PRESSURE VESSELS FOR GASES, LIQUIDS AND SOLIDS

C-clamp swivel

SINCE a C-clamp without a pad is useless, a new type of swivel is 100% lossproof, manufacturer claims. No crimping is used in assembly; inside the collar a groove is machined which accepts a hardened steel spring. Clamps are assembled by forcing the spindle ball past the spring. *Wilton Tool Mfg. Co., Inc.*

Circle No. 37

Protective coating

CORROSION-resistant "Zincilate 400" is a coating originally developed for the automotive industry which answers the welding problem of how to get conductivity through a protective coating without destroying corrosion resistance. Weldable even when dry, the coating prevents rust creepage at the point of weld, regardless of elapsed time between application of coating and welding. On spot welding work, the new coating does not contaminate the electrodes. It prevents corrosion that normally occurs when two dissimilar metals are welded. *Industrial Metal Protectives, Inc.*

Circle No. 38

Solenoid valves

PILOT-operated, solenoid-controlled, four-way valves are designed to provide all porting and positioning arrangements on circuits up to 3,000 psi. Shorter in overall length than any comparable valve, the 4-way valves feature drawn-steel solenoid covers and short solenoid power stroke. Internal retaining cords secure covers to valve body. Capacities are 30 gpm and 5 gpm for the ¾ in. pilot and ¼ in. solenoid valves. Two series are available singly. *Denison Engineering Div., American Brake Shoe Co.*

Circle No. 39

Air, oil cylinders

NEW line of air and oil cylinders for industrial, mobile and farm applications offers eight bore sizes: 1½, 2, 2½, 3, 3½, 4, 5 and 6 in., incorporating 10 different mounts: clevis, eye, tube, front flange, rear flange, rabbit, pilot, centerline, side lug and foot. Cylinders come with "o" ring seals for pressure up to 3000 pi. Stroke lengths are available up to 10 ft as standard. *HemcO Mfg., Inc.*

Circle No. 40

NEWS . . . . . *from page 8*

Wall Colmonoy sent questionnaires to brazing authorities across the country asking their opinion of the proposal.

Those who replied felt that the company was on the right track, but few accepted the proposal without asking some modification. However, the following conclusions were reached:

—Shear strength data must be used with considerable caution in design engineering work.

—Details for fabrication of test specimens should be included in the standard procedure.

—The test specimen design as proposed by Wall Colmonoy may require changes.

—Reproduction of results is a problem that will have to be a prime target for future investigations.

One result of the proposal was the establishment of a special sub-committee of the brazing and soldering committee of the AWS. The sub-committee is headed by Harry Schwartzbart, supervisor of welding research at Armour Research Foundation, Chicago.

Norton buys Ohio site

Norton Co. has purchased 120 acres of land in Piqua, Ohio—in the center of one of its major markets. "It is an excellent spot and a logical location for a distribution center," remarks John Jeppson, vice president and director of manufacturing.

Wisconsin to hold pipe welding institute

The Extension division of the University of Wisconsin, Madison, will hold a pipe welding institute Oct. 16 and 17. Pressure piping and vessels will be the main topic covered. The Wisconsin chapter of the National Certified Pipe Welding Bureau will take part in the dinner meeting.

Construction starts on USS building

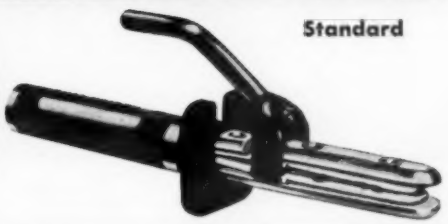
Construction on a new United States Steel Co. electromechanical development building has started. The building is at the firm's research center in Monroeville, Pa. The electromechanical laboratory will add 54,000 sq ft of floor space to what is said to be the largest laboratory in the free world devoted exclusively to research in steel and related problems.

DURO

The Standard

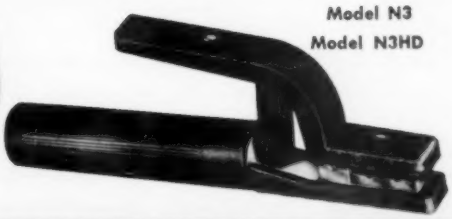
The NEW DUROGON

The Standard DURO Holder



Perfect Balance • Easy Replacement of Parts • The Long Jaw makes the hard to get at places easily accessible. After 26 years of proven performance these features make the DURO Standard still the Preferred Holder.

DURO'S NEW Holder The Durogon



Model N3 New alloy, high tensile strength, light-weight aluminum body.
Long Life Copper Alloy renewable jaws.
Extremely cool operation. Fully Insulated.
Jaw Insulation resists high temperature.
All parts quickly replaced using only a screwdriver.
Rugged Heavy-Wall Fibre Grip.
Solderless Type, proven cable connection.

Model N3HD Recommended for Heavy Duty continuous service.
All the features of the Aluminum model Durogon, but this body is made of rugged high conductivity bronze for super conductivity and choice of mechanical, soldered or brazed cable connection.
In addition, this heavy duty model has an extra long, heavy-wall fibre grip.

Write for literature and name of nearest distributor.

DURO ENGINEERING COMPANY
51 OREGON AVE HAMDEN CONN

cam-lok

neoprene insulated

CABLE CONNECTORS

. . . the smoothest connection you can make!

Tapered and Vulcanized . . . Trouble-Free

No more bulky cable connections to "foul up" on obstructions and delay production. Now you can make shockproof, waterproof cable connections in your own plant in minutes with a 110 volt portable Vulcanizing Kit. Seals prefabricated neoprene insulating sleeves to cable jackets . . . cable breakage at connector is eliminated . . . cable jackets cannot pull away. Connectors lock tight—stay tight! Join all cable sizes instantly without adaptors.

The Cam-Lok Vulcanizing Kit can also be used with an adaptor mold to make neoprene insulated, waterproof *Cable Splices!*

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EMPIRE PRODUCTS, INC.
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Testing course offered at Ohio

A course designed to present the fundamental principles of non-destructive testing will be offered by Ohio State University, Columbus, from Sept. 8 to 19.

No prerequisite training or experience is necessary to register in the course. It will begin with the principles underlying each test method, and will then progress to advanced forms of equipment and techniques.

The scope of the course is to present the:

—basic principles underlying all forms of nondestructive tests and their applications.

—advantages and limitations of each basic test method.

—equipment procedures and techniques of testing.

—interpretation of test indications in terms of material discontinuities and serviceability.

Detailed instruction will be given on the theory of 10 different test methods. Specific training in the use of 14 different machines and procedures will also be part of the course. Plant visits to Columbus area industry will be arranged if requested.

The course will consist of 10 eight-hour days, which will include lectures, discussion and laboratory work. Reading assignments will be given and the Davis Welding Library resources will be utilized.

The course will be under the direction of the faculty of the university's department of welding engineering. Dr. Robert C. McMaster, past president of the Society for Non-Destructive Testing, Inc. will present material on the fundamentals of the course.

Daily quizzes and an intensive final examination will determine the completion of the course. Certificates will be presented to those who satisfactorily pass the tests.

Techline new Wheelabrator Division

Techline Division, formerly Crandall Engineering and Mfg., Inc., Vicksburg, Mich., is a new division of Wheelabrator Corp., Mishawaka, Ind.

It will be responsible for the manufacture and sale of precision finishing equipment, including barrel finishing machines and wet blast equipment.

George H. Lieser will be field sales manager of the division. He was department head of wet blast equipment for Wheelabrator.

NEW cylindrical package designed to protect valuable stainless steel and nonferrous welding fittings and flanges by Tube Turns, Louisville, Ky.

First ultrasonic exhibit for New York City

The first international ultrasonic exhibit and conference will be held Nov. 13-15, 1958, at the Hotel Statler in New York City. Exhibits will be shown in the new street-level facility of the hotel. Exhibits will show applications of ultrasonic equipment in such fields as cleaning and degreasing.

Westinghouse builds transformer plant

Muncie, Indiana, has been chosen as the site for the new Westinghouse multi-dollar power transformer plant. The plant is expected to begin production by 1962, and will employ more than 2,000 persons.

Lincoln foundation honors bridge designers

Farland C. Bundy and Charles S. Matlock, engineers with the Bridge Div., Texas Highway Dept., Austin, received the $10,000 first award in the recently judged James F. Lincoln Arc Welding Foundation welded bridge design competition.

Bundy and Matlock shared the award for design of the recently completed Buffalo Bayou Bridge, Houston. The structure is a 668-ft, all-welded, continuous-plate-girder bridge.

Designs were judged on the basis of economical uses of labor and steel, appearance, cost, general quality of detail, and other advantages of all-welded construction.

The same bridge has received recognition in a competition for the most beautiful steel bridges erected in 1957. (See *WE*, January, p. 29).

The wear of construction equipment parts is one of the highest cost factors of contractor operations. Only careful inspection and regular systemized maintenance can hold this cost down.

To promote regular inspection of equipment parts, Ranite offers at no cost or obligation their new Ran-Check-Charts and Stickers for systemized preventive maintenance. They provide an easy way for periodic checking of all non-lubed part surfaces so as to prevent "wear beyond repair" conditions.

For maximum wear-life Ranite's seven types of Job-Graded, Color-Coded hardsurfacing rods have been formulated to meet all wear conditions whether caused by abrasion, impact or a combination of both forces. Smooth running, all position, rapid deposition Ranite rods cover more area per pound making it most economical to use.

Get your *free* Ran-Check-Charts and Stickers from your local Ranite distributor or write direct *today*.

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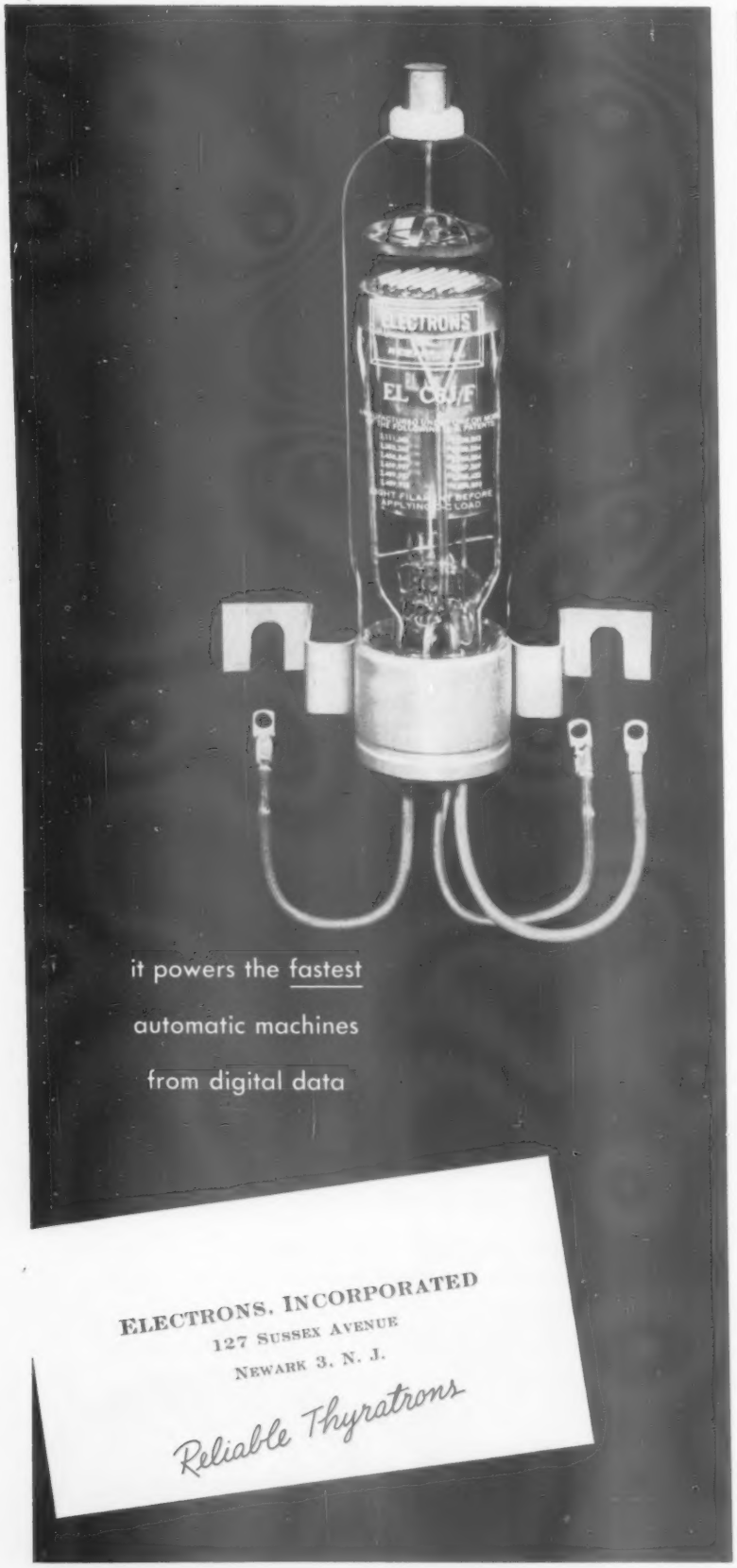

SOLAR Aircraft Co. manufactures nose cones for the Lacrosse guided missile at its San Diego plant. Lacrosse, built by the Martin Co., Orlando, Fla., is close and general support weapon used by Army and Marine Corps. Some unique welding processes are involved in its fabrication, but more details are unavailable, WE learned, because of security restrictions.

Wall Colmonoy installs special vacuum furnace

Wall Colmonoy Corp., Detroit, has installed a new 32-in. vacuum furnace for degreasing, annealing and brazing. The special furnace was designed for unusually low pressure operation so the time required for effective processing could be reduced. It can take parts up to 30-in. in diameter and 4½-ft long. Processing temperatures reach 1,850 F and pressures drop as low as 0.01 micron.

Pipeline News

Temporary FPC authority has been granted Ohio Fuel Gas Co., Columbus, Ohio, to develop a natural gas storage field in Medina County, Ohio. The new storage field will include 12.4 miles of 4½ to 20 in. pipeline and a 3,300 hp compressor station. The cost for the initial conversion is $2,171,400. The ultimate cost for the full development will be $5,075,500.

Michigan Wisconsin Pipe Line Co., Detroit, Mich., has received FPC presiding examiner authorization to build natural gas facilities from its main line to Laverne Field, Harper County, Okla. The line will consist of 56 miles of 20 in. lateral pipe. Nine new main line compressor stations will produce a total of 31,500 hp, which will be added to the power of four existing stations. Total cost is $19,453,000, and will expand its daily capacity by 40,000,000 cu ft.

United Fuel Gas Co., Charleston,

COMING EVENTS

SEPT. 8-10: Canadian Section, Compressed Gas Association meeting, Seigniory Club, Montebello, P.Q., Canada.

SEPT. 18: NEMA Arc Welding Section Quarterly Meeting, Cleveland.

SEPT. 25-26: NWSA Eastern Zone Meeting, Benjamin Franklin Hotel, Philadelphia.

SEPT. 29-30: NWSA Central Zone Meeting, Morrison Hotel, Chicago.

OCT. 20-24: National Safety Congress and Exposition, Hotels Conrad Hilton, Congress, Morrison, La Salle, and Hamilton, Chicago.

OCT. 27-28: NWSA West Central Zone Meeting, Hotel Muehlebach, Kansas City, Mo.

OCT. 27-31: 1958 National Metal Exposition and Congress, Cleveland Public Auditorium, Cleveland.

OCT. 30-31: NWSA Western Zone Meeting, Riviera Hotel, Las Vegas.

DEC. 1-2: NWSA Southeastern Zone Meeting, Dinkler-Tutwiler Hotel, Birmingham, Ala.

DEC. 4: NWSA Southwestern Zone Meeting, The Statler Hilton, Dallas, Tex.

DEC. 4: NEMA Arc Welding Section Quarterly Meeting, Chicago.

JAN. 26-29: Plant Maintenance and Engineering Show, Cleveland Public Auditorium, Cleveland.

MARCH 12, 1959: NEMA Arc Welding Section Quarterly Meeting, Pittsburgh.

MARCH 16-20, 1959: ASM Western Metal Exposition and Congress, Pan-Pacific Auditorium and Ambassador Hotel, Los Angeles.

APRIL 7-10: 1959 AWS Welding Show, International Amphitheatre, Chicago, Ill.

JUNE 4-5, 1959: NEMA Arc Welding Section Quarterly Meeting, Hot Springs, Va.

W. Va., can sell natural gas to a new affiliate, Ohio Valley Gas Co., Columbus, Ohio, says the FPC. The gas will be delivered wholesale to Ohio Valley and will be resold in 13 communities near Portsmouth, Ohio.

Distributor Appointments

A. O. Smith Corp., Milwaukee: General Welding and Industrial Supplies Ltd., Toronto, Can.

Rivett Lathe and Grinder, Inc., Boston: Stanley M. Proctor Co., Cleveland.

Worthington Corp., Plainfield, N. J.: Anderson Equipment Co., Los Angeles; San Diego Welding Supply, San Diego County; Welder's Supply Co., Cambridge, Mass.; Welders Supply of Worcester, Inc., Worcester, Mass.; Savannah Oxygen and Supply Co., Savannah, Ga.

Wallace Supplies Mfg. Co., Chicago: M. N. Thackaberry, Inc., Los Angeles.

Compagnie Generale d'Electro—Ceramique, France: Gulton Industries, Inc., Metuchen, N. J.

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float through the roughest jobs . . .

Even on the toughest flash and weld removal operations, you can depend on Atlantic Grinding Wheels for fast, cool, clean-cutting action. Made with a special resinoid bond to withstand high centrifugal forces and assure maximum safety, they have a smooth, floating action that calls for less pressure on the grinding surface . . . helps reduce operator fatigue and increase efficiency.

If you have any type of metal removal or smoothing problem, it will pay you to give Atlantic Grinding Wheels a trial run. An Atlantic representative will be glad to recommend the right wheel for your specific requirements. Write for details and a copy of the Atlantic Grinding Wheel Catalog. Atlantic Abrasive Corp., 540 Pearl Street, So. Braintree, Mass.

Atlantic Abrasive Corp.

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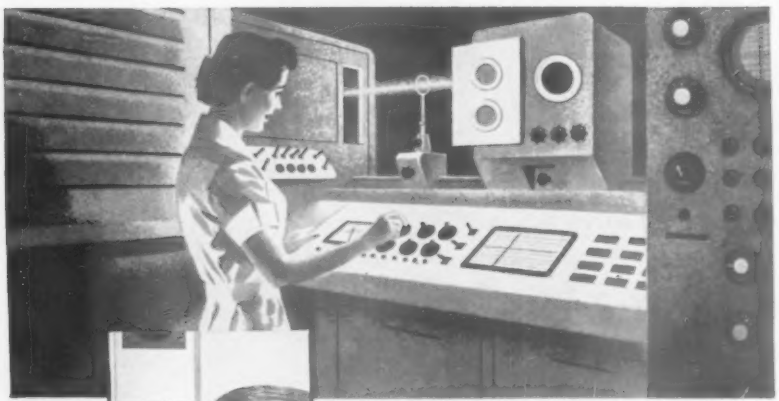

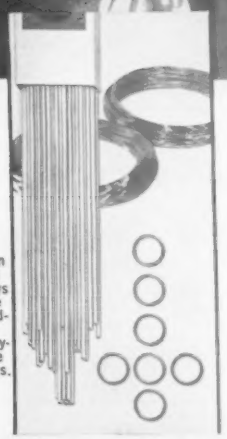

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Scientific Color analysis keys quality control of United Phoson and Sil-bond brazing alloys

Brazing results depend upon alloy uniformity . . . that's why United scientifically controls this vital factor through the modern miracle of **spectrographic analysis.** Skilled technicians **arc test** United Phoson and Sil-Bond alloys. This sets up a color spectrum which is analyzed by ultramodern, spectrographic equipment . . . and results in the most positive alloy check ever developed!

Spectrographic control coupled with United's continuous casting production processes are the reasons why Phoson and Sil-Bond alloys assure uniform results, speed up production and reduce finishing requirements.

A colorful new 8-page booklet, "Low Temperature Brazing Engineering Facts and Data" is packed with valuable information which you need for more profitable brazing. A copy is yours free. Write, wire or phone, today.

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Specify **UNITED** *for brazing alloys, aluminum, brass, copper tube and wire*

About people

Matthews

L. G. Matthews is the new secretary of the International Acetylene Association, replacing the late Herb Reinhard. Matthews is the manager of safety codes for Linde Co., the same position Mr. Reinhard held. The new secretary is a member of the American Welding Society.

The American Society for Metals has announced appointment of a new secretary, temporary manager and advisory council, and has established a new position—secretary to the board of trustees. *Adolph O. Schaefer*, president of Pencoyd Steel and Forge Corp., Philadelphia, accepted the appointment of the board of trustees and will replace the late William H. Eisenman as national secretary. *Ray T. Bayless*, assistant secretary, will also act as temporary manager of activities. Advisory council members are *A. P. Ford, Evelyn G. Gardner, Taylor Lyman, Ernest E. Thum* and *Chester L. Wells*. Miss Gardner was also selected secretary of the board of trustees.

William L. Disston has been appointed regional sales manager, Defense Division, western region, by Budd Co., Philadelphia. He will headquarter in Los Angeles at the company's newly established western office. In addition to the defense division, the office will coordinate the activities of Budd's Nuclear Systems Division.

Square D Co., Detroit, has appointed *Mitchell P. Kartalia* general manager of its marketing division.

Wilbur Hering Armacost, vice president-consultant and chairman of the technical committee at Combustion Engineering, Inc., New York City, has been awarded the American Society of Mechanical Engineers Medal for distinguished service in engineering and science. Armacost has been awarded 75 patents for materials and developments of design adaptable to high temperatures and pressures. The medal will be presented at the society's annual meeting in New York, in December.

Roe

Boring

New sales manager for the J. B. Nottingham Co., New York City, is *Walter G. Roe*, formerly associated with General Electric Co., Atlantic District.

Donn Boring has been appointed equipment sales manager for American Oxygen Service Corp., Harrison, N. J. Boring was at one time associated with Tweco Products, Inc., Wichita, Kans.

The newly created position of personnel director on the staff of Chemetron Corp., Chicago, has been filled by *Samuel A. Pond*. He will direct personnel matters, and coordinate personnel activities of divisions and subsidiaries, while headquartering in Chicago.

William T. Wilbur has been appointed chief engineer for the Progressive Welder Co., Pontiac, Mich. He will be in charge of the company's standard lines of resistance welding equipment. *Stephen E. Jerome* has been named factory manager.

Plainfield, N. J. Div. of Worthington Corp. has appointed *Gerald A. Guerin* and *Paul F. DeLisi* as positioning equipment distribution supervisors. Guerin will headquarter in the Chicago office while DeLisi continues to work out of the Plainfield division.

Gene B. Evridge has joined Eastman Kodak Co., Rochester, N. Y., as technical representative specializing in industrial radiography for the midwestern territory, headquartering in Chicago.

Philips Electronics, Inc., Mt. Vernon, N. Y., has named *Joseph Meisler* technical commercial manager of its Cryogenics Department. He will have charge of low-temperature problems and applications involving liquid-air and nitrogen generators. Meisler is a member of the American Institute of Chemical Engineers, and the American Rocket Society.

Clyde R. Guder has been appointed district engineer to succeed *N. J. Law*, by the American Institute of Steel Construction, Inc., St. Louis.

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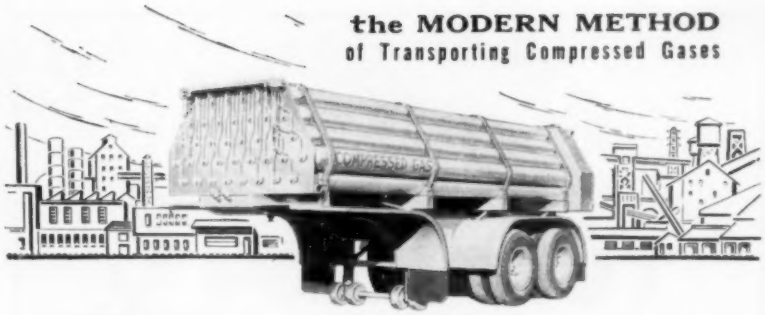

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Offers You Over 200 PROVEN Standard Stock Models of Quality POSITIONERS
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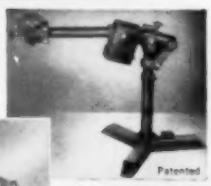
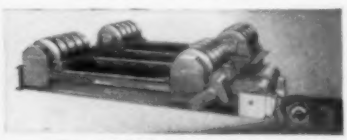
Aronson TracTred (T. M. Reg.) Turning Rolls for thin-walled heavy cylindrical work to 27 tons capacity. Zero to 100 IPM turning speed and Built-In Grounding.

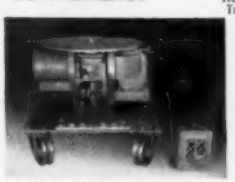
Aronson Universal Balance Positioners (T. M. Reg.) position your weldments effectively, instantly for downhand welding. Capacities to 2000 lbs.



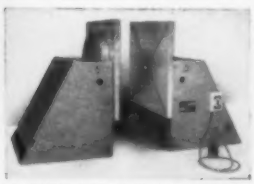


Heavy Duty Precision Built Rubber and Steel Tired Turning and Pipe Rolls, 100% overload protected. Capacities to 600 Tons.

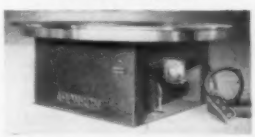
Fully Automatic Gear Driven Positioners, featuring Geared Elevation, 135° Tilting and Variable or Constant Speed Rotation. Capacities to 350,000 lbs.



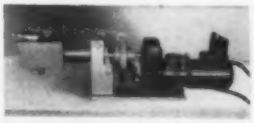
Model D Gear Driven Positioners. Compact. Precise. Rugged. Capacities to 1000 lbs.



Rugged Head and Tail Stock for positioning bulky weldments between centers. Table Backup for Zero Deflection. Magnetic Braking. Capacities to 160,000 lbs. Geared Elevation Optional.



Heavy Duty Floor Turntables with precision speed control and Magnetic Braking, used for welding, burning, X-raying, etc. Capacities to 120,000 lbs., various heights and speeds.



Bench Turntable Automatic Positioners with Mercury Grounding. Capacities to 500 lbs.

Quality POSITIONERS by Aronson MACHINE COMPANY
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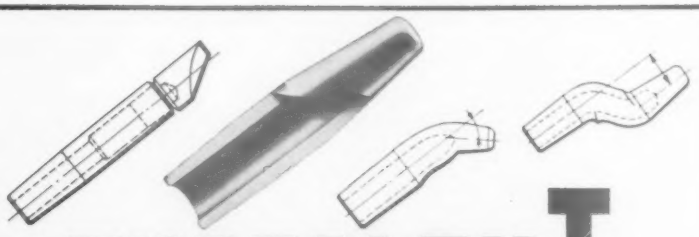

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• **FORGINGS,** a large stock of bars and wheels available for finishing. Special forgings to order, rough, or finish-machined.

• **WELDING TIP HOLDERS and ADAPTERS**

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MEMBER NATIONAL WELDING SUPPLY ASSOCIATION

SOLE PRODUCERS

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William A. Baltzell has been promoted to sales manager by Oakite Products, Inc., New York City. He will be responsible for the company's 17 divisions and 240 technical service representatives in the U. S. and Canada.

Crucible Steel Co., Pittsburgh, recently appointed *Donald S. Foote* works manager of the Titanium Div. at Midland, Pa. Also in Midland, *Howard T. Clark* has been added to the newly-created technology department. *William R. Howell* is new assistant to the vice president of operations at the Midland works, and *George M. Burrier* replaces him as works manager.

Edmund Pfeifer was promoted to director of purchases for Lukens Steel Co., Coatesville, Pa. Succeeding Pfeifer as manager of by-products and Luken-weld fabrication sales is *Richard Y. Moss. Lou Seacat* was named assistant controller of management services.

Black and Decker Mfg. Co., Ltd., Brockville, Ont., has appointed *Glen C. Wilhide, Jr.* its general manager. He is responsible for complete operations of the electric tool company. *Alexis N. Dahl* has been appointed purchasing manager for the parent company in Towson, Md., succeeding Wilhide.

Col. John N. Dick, former chief of Manufacturing Methods Branch of the Air Material Command, U.S.A.F., has joined Allegheny Steel Corp., and will be located in its Washington D. C. offices.

Jack W. Stacey is the new chief engineer in charge of product development and improvement for the Hammer Blow Tool Co., Wausau, Wis. A mechanical engineer, Stacey will be available to customers for consultation.

Paul W. Steen has been appointed manager of distributor sales for Narda Ultrasonics Corp., Mineola, N. Y.

Died . . .

Keith Towns died as a result of a heart attack suffered June 9. Mr. Towns was sales manager for the United Wholesalers, Inc., Sioux City, Ia.

Lloyd A. Baldwin, proprietor of the Baldwin Welding Works, Parsippany, N. J., died recently at 61. Mr. Baldwin specialized in joining difficult-to-weld materials. The Baldwin works has been permanently closed.

TECHNIQUES OF PLANT MAINTENANCE & ENGINEERING—1958. Published by Clapp & Poliak, Inc., New York, 1958. Cloth, 8½ by 11 in., 211 pages. Price $10.

"Techniques of Plant Maintenance & Engineering—1958" is the ninth volume in a series and reports proceedings of the plant maintenance and engineering conference held in Chicago in January, 1958. Included are 35 papers with discussions, questions and answers. In addition there are charts, tables and other illustrations.

In the introduction, L. C. Morrow, general conference chairman, points out that the investment companies have in the maintenance worker now averages over $63,000. While most papers and discussions have general applications to all industries, some industries are given special attention. These are the metal fabricating, petroleum-processing, rubber, chemical, food-processing, foundries, steel mills, pulp and paper mills. A new feature is a discussion of maintenance and research in development laboratories.

Of special interest is a paper "Welding in maintenance," which points out the all-important role that welding plays in keeping the modern industrial plant in operation. Among other papers included are those dealing with "Maintenance in small plants", "Fundamentals of preventative maintenance", "Getting work cooperation from maintenance employees", "The broad responsibilities of plant engineering", and "Fundamentals of maintenance cost control."

Like its predecessors in this series, the ninth volume will prove to be a valuable addition to your maintenance library.

Plant engineering

PLANT ENGINEERING PRACTICE. By editors of *Plant Engineering*. Published by F. W. Dodge Corp., New York, 1958. Cloth, 8¾ by 11⅝ in., 704 pages. Price, $18.50.

"Plant Engineering Practice" is a compilation of articles previously published in *Plant Engineering*. A valuable source book, its sole pur-

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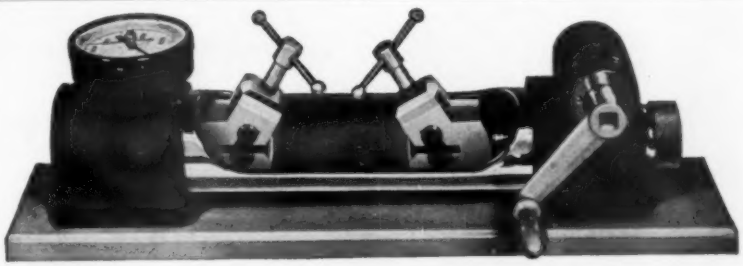

For shop or field—a new

Portable Tensile Tester

Use this compact, precision tensile tester to test strip steel, wire, bolts, spot welds, or anything else within its 4,000 lb. capacity. Besides its use for inspection work in the shop, this portable device provides a convincing method of demonstrating the tensile strength of various materials in sales demonstrations and trade shows.

Only a moderate pull on the crank is sufficient to apply the maximum load. Results are easily read from the load gauge. Simple to use, anywhere, any time. Write for catalog sheet and price.

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- Welds up to ¾" with tips included.
- Cuts 1" steel (up to 4" with optional tips).
- Slip-in tips seat perfectly by hand—no wrench needed.
- Exclusive "Flo-Trol" diaphragm protects against back-fires; eliminates seat burn out.

Each set is packed in "easy carry" carton. Contains everything needed.

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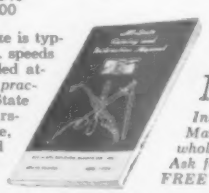

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pose is to offer tested solutions to many problems that plant engineers and their staffs encounter daily. Authoritative data covers all important areas of plant engineering. In all, there are 226 detailed studies organized into 13 extensive sections, e.g., sites and layouts, construction, housekeeping and safety, material handling, maintenance, paints and protective coatings, mechanical power and piping systems, electric power, lighting, utilities, heating, ventilating and air conditioning, instrumentation and quality control, and shop work. In the last-named section data is presented on adhesives, welding, brazing and silver brazing.

The studies have been made more practical by using over 800 pictures and line drawings.

Since the background for this huge volume entails more than four years of editorial research, the result is a tool of great value to plant engineers and other engineers, architects, industrial contractors and executives.

Industrial buildings

BUILDINGS FOR INDUSTRY. By the editors of *Architectural Records*. Published by Dodge Books, New York City, 1958. Cloth, 8¾ in. by 11½ in., 390 pages. Price, $9.75.

If you are interested in building a new plant, you will be interested in the 74 profusely illustrated examples of successful industrial buildings described in "Buildings for Industry." Based on a number of articles which have appeared in Architectural Record over the past six years, this authoritative study of new contemporary industrial architecture presents typical problems in industrial building design and gives proven solutions developed by some of the world's top architects and engineers.

The volume opens with a section devoted to design principles and provides comprehensive treatment to a variety of subjects such as material handling, feeding, employee facilities and circulation, electrical systems, air conditioning and lighting, functional color, etc. The remainder of the book analyzes in detail 74 successful industrial architectural treatments by industrial category, such as warehouses, light industry, consumer goods, manufacturing laboratories, utilities and service industries, and heavy industries. In these instances the text fully explores and explains the choice of site, plans, lighting, color, location of plant components, such as washroom, cafeteria, parking lots, etc., and includes design details. There are several interesting examples of the use of weld-

ed construction in those plants covered.

This is a book that should be of obvious interest to architects, engineers, contractors and industrial executives and anyone concerned with buildings which house American industry.

ASME handbook

ASME HANDBOOK — METAL ENGINEERING PROCESSES. Edited by Roger W. Bolz. Published by McGraw-Hill Book Co., New York, 1958. Cloth, 7½ by 10 in., 428 pages. Price, $13.50.

This is the final volume in the ASME handbook series. It is composed of 45 sections which present detailed data on the various processes by which metals are converted into finished products. Areas covered are heat treatment of steel, castings, hot working, cold working, powder metallurgy, welding and cutting, machining, finishing and electro-forming.

For each manufacturing method there is a compilation of basic physical characteristics to be considered and the general advantages and limitations usually encountered. Concise, parallel data concerns suitability of various metals for each process and the natural tolerances on size and surface finishes obtainable. Assisting in evolving designs that meet all functional requirements consistent with economical production techniques, is data illustrated with hundreds of charts, drawings and pictures.

Welding and cutting, which represents more than one-third of the book, is covered in some detail with special sections devoted to the subjects of flame cutting, welding processes, design for welding, resistance welding, furnace brazing, soldering and metallizing.

It is a valuable addition in the ASME metal engineering series.

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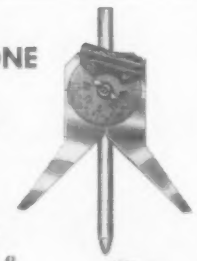

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51. METALLIZING — Metallizing Co. of Los Angeles. Advantages of metallizing for coating machine parts, corrosion resistance, heat resistance and decorating and replica coating are listed in brochure.

52. TIG TORCHES—K-G Equipment Co., Inc. Sixteen-page booklet describes company's line of Vis-Arc Tig welding torches and tungsten electrodes. Includes pictures, specifications, diagrams, parts lists and comparison charts.

53. STUD WELDING—Shielded Stud Welding Co. Technical sheet describes method of stud welding pins to galvanized steel duct work to secure insulation. Includes diagrams, step-by-step procedure and specifications.

54. RESISTANCE WELDING — General Electric Co. Folder describes company's new line of resistance-welding non-synchronous controls, and tells how these controls can cut welding costs.

55. ROSIN FLUX — Federated Metals. Bulletin 178 tells of company's R-X3M activated liquid rosin flux that can be used for high speed production soldering.

56. INDUCTION HEATER—Allis-Chalmers Mfg. Co. Construction and design features of high-frequency induction heaters and induction melting furnaces are described in bulletin 12B6430B.

57. TUBULAR PRODUCTS — Babcock and Wilcox Co. Bulletin TB-417 presents information on the application of tubing, pipe and welding fittings. Includes application of data, and points of consideration in selection of materials.

58. WIRES AND TIPS—Wall Colmonoy Corp. Pocket-size booklet gives brief instructions in the use of company's welding and brazing wires and tips.

59. RECTIFIERS—International Rectifier Corp. Bulletin SR-143D uses pictures, graphs, tables to describe 30 to 115 amp (half-wave) silicon diodes.

60. TANTALUM—Fansteel Metallurgical Corp. March issue of "Fansteel metallurgy" tells of company's new program to have tantalum sheets available from warehouse stocks. Gives specifications, other information.

61. X-RAY MICROSCOPE—Philips Electronics, Inc. Reprint from "Norelco reporter," Vol. 4, No. 6 has pictures, diagrams and graphs describing a high-revolution microscope with electron microscope conversion.

62. PORTABLE CUTTING MACHINE—National Cylinder Gas Co. Brochure describing Cut-O-Matic No. 7 portable flame cutting machine and how it makes straight line, bevel, circle and stock cuts.

63. THREE-PHASE RECTIFIER — Taylor-Winfield Corp. "Weld-it" No. 579 tells how Tri-Phase solved production problem in fabricating skin surfaces of military rocket.

64. TORCH BRAZING—United Wire and Supply Corp. Bulletin B-53-3 gives instructions and specifications for company's line of wire brazing alloys.

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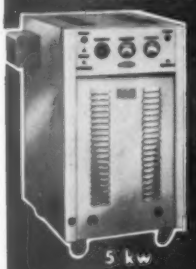

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Long Beach, Calif.

65. WELD INSPECTION—Sperry Products, Inc. Reprint 50-884 tells of an electronic system used to inspect welds. Includes schematic layout of the inspection circuit.

66. ARC-WELDING—Linde Co. "Metalworking bulletin" Vol. 9, No. 6 includes articles on Tig and CO_2 Mig welding.

67. METAL SAVINGS—Metallizing Engineering Co., Inc. Four-page flyer tells of bulletins put out by company on equipment, handbook and instruction manuals and other metallizing literature, and how they can be had.

68. TOOL TIP BRAZING — American Platinum Works. Description of Silvaloy Plymetal for tool tip brazing, what it can do, and drawings of finished products.

69. TITANIUM—Mallory-Sharon Titanium Corp. "Fact file" on titanium can be convenient reference piece for materials, design and production engineers.

70. FIRE GUARDS—General Detroit Corp. Catalog listing specifications, prices and pictures of company's line of fire extinguishers.

71. CUSTOM SHAPES—Diamonite Prod. Mfg. Co. Sheet showing different shapes company makes for induction heating, welding and brazing use. Gives description, specifications and properties of products.

72. OXYACETYLENE CUTTING—J. Muller, GMBH. Flyer tells of automatic oxyacetylene pipe-cutting machine that cuts formed, straight and mitre shapes. Describes how machine works on a mathematical basis without the use of patterns or templates.

73. STAINLESS STEELS—Alloy Casting Institute. Details on the machining, welding and heat treating of cast corrosion resistant and heat resistant high alloys available.

74. CYLINDER VALVES—Matheson Co., Inc. Pamphlet shows diagrams and data concerning line of compressed gas cylinder valve outlets and connections.

75. AIR-CYLINDERS — Teer-Wickwire and Co. Bulletin A-101 describes the Lindberg 150 psi A-line air cylinder. Gives diagrams, dimensions, pictures and uses.

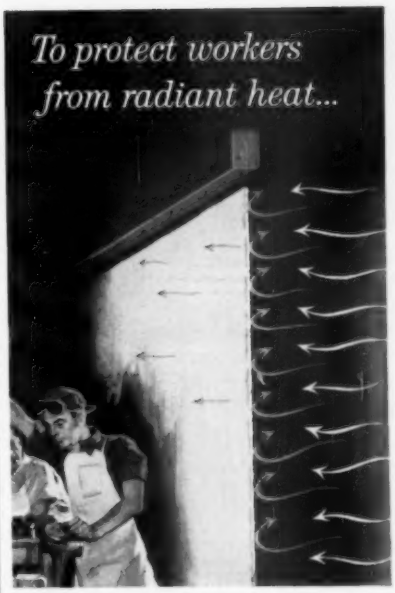
76. PORTABLE WELDER — National Cylinder Gas Co. Company tells of Sureweld 200 amp d-c portable welder with 1,500 W power take-off in 2-color folder. Gives performance data and dimensions.

77. DEW POINT DETERMINER—Illinois Testing Laboratories, Inc. Illustrated 8-page bulletin describes Alnor Dewpointer (R), which works on principle of varying pressure, rather than temperature, in determining dew points of any gas sample.

78. RESISTANCE WELDING — Sciaky Bros. Inc. "Resistance Welding at work", Vol. 5, No. 2, tells case histories which point out production advantages of company's three-phase techniques. Includes article on resistance welding galvanized steel.

79. WATERLESS HAND CLEANERS—Milburn Co. Brochure telling of company's line of protective cleaners, and the results of a 4-month test to see if hand cleaners produce dermatitis.

80. TURNING ROLLS—Cayuga Co., Inc. Bulletin No. 5713 uses pictures and tables to describe its Cayuga-matic power and idler turning rolls. Includes specifications.



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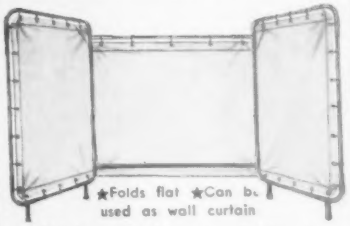

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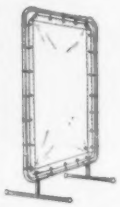

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81. ELECTRODE OVENS—Phoenix Products Co. Literature describes medium, large and portable size models of DryRod ovens; includes chart with recommended temperatures for preserving and maintaining electrode quality.

82. WELDING ACCESSORIES—Monarch Products. Catalog 24 shows pictures and specifications of welding and safety equipment. Includes helmets, shields, cables and lugs.

83. TRANSFORMERS — Allis-Chalmers. Research facilities for company's line of transformers along with their design and construction features are described in a new bulletin 61B186C.

84. OXYGEN STATIONS — Cambridge Corp. Loxette 3000 oxygen consumer station specifications, picture and description sheet.

85. GAMMA RADIOGRAPHY—Budd Co. Specifications, operation, applications and safety features of the series 1060 Multitron for radiography are included in 4-page booklet.

86. BLOCKS AND PLATENS—Acorn Iron and Supply Co. Pamphlet cataloging bending blocks, welding platens and stands gives their description and specifications.

87. TURNING ROLL AND IDLERS—Unique Equipment, Inc. Sheet shows how turning roll and idlers are built into dolly.

88. WORK GLOVES—The Granet Corp. Colorful booklet pictures work gloves for industry. Includes neoprene, Dynagluv, Granetgrip, etc.

89. METAL REMOVAL—Arcair Co. Pamphlet shows Arcair Torch at work. Gives uses and specifications.

90. TUBE CUTTER—Nickleson Tool and Die Co., Inc. Woerner hydraulic operated tube cutter is explained and described in booklet that includes diagrams of the cuts the machine is capable of making.

91. RUBBERIZED ABRASIVES—Cratex Mfg. Co. Rubberized abrasives for deburring, smoothing and polishing, what they are, and what they can do are covered in company catalog.

92. HARDFACING — Rankin Mfg. Co. The importance of hardfacing regarding preventive maintenance of construction equipment is explained in 2-color brochure.

93. ELECTRICAL CONTROL—J. I. C. Electric Co. Advantages of centralized electrical control and information on typical control centers offered in 4-page brochure.

94. GROUND FLAT STOCK—DoAll Co. 22 by 28 ft. wall chart simplifies selection of ground flat stock. More than 1,500 standard sizes of tool steel listed with analyses, tolerances and decimal equivalents.

95. COMPARISON CHART—American Brazing Alloys Co. Reference chart lists numerically the entire Ambraze line and its comparison of alloy numbers to the two other leading lines of brazing alloys.

96. STEEL TUBING—Jos. T. Ryerson and Son, Inc. Bulletin 12-10 features simplified selection chart which provides data such as characteristics, size range and relative cost of seamless and welded tubing.

97. HARDFACING—Eutectic Welding Alloys Corp. "Hard surfacing maintenance—industry's economy weapon," is 20-page (TIS 2821) publication on overlays.

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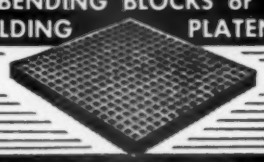

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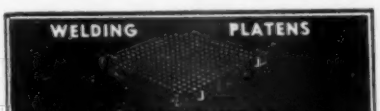

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AD INDEX

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Literature offered in ads

125. Air Reduction Sales Co.— To help you select the right elctrode for your specific job write for catalog 1318, "Airco Electrode Guide."

126. Alloy Rods Co.—Write for Bulletin AR-10-2 on "Arcaloy" stainless steel electrodes.

127. All-State Welding Alloys Co.—Further information on flux-coated rods; also new instruction manual available.

128. Aluminum Co. of America—Write for booklets and films that show how easy it is to weld, braze and solder aluminum.

129. American Brass Co.—Write for a copy of new Publication B-13, to help in the selection of the exact rod for your job.

130. American Manganese Steel Div.—Further information available on "Amsco" manganese steel plate linings.

131. American Messer Corp.—Write for full information on American Messer's oxygen cutting machines.

132. American Optical Co.—Write for further information on the "White AO Weld-Cool" welding helmet.

133. American Platinum & Silver Div.—Two complete reference manuals for low-temperature silver brazing and fluxing are available.

134. Ampco Metal Inc.—Catalog, price list and distributor's name available on "Ampco-Weld" resistance-welding electrodes.

135. Aronson Machine Co.—Detailed engineering data available on Aronson's positioners.

136. Atlantic Abrasive Corp.—Catalog available on Atlantic Grinding Wheels, to help you in any type of metal removal or smoothing problems.

137. Atlas Welding Accessories Inc.—Further information available on the Atlas line of weld cleaning tools and the new "Jaw Cleaner."

138. Belden Mfg. Co.—Write for further information on Belden's welding cable.

139. Calumet Paint Products, Div. of W. C. Richards Co.—Further information available on rust preventive primers

140. Cam-Lok Div.—Write for catalog No. 131-B on the complete Cam-Lok line of neoprene insulated Cable Connectors, Splices and Machine Receptacles.

141. Carol Cable Co.—Information on "Dynapower" welding cable available.

142. Contour Marker Corp.—Information and instruction book on laying out pipe joints.

143. Contour Marker Corp.—Details on establishing and marking a point at any angle.

144. Coyne Cylinder Co.—Write for details on Coyne Acetylene Cylinders.

145. Detroit Testing Machine Co.—Write for catalog sheets and prices on the new portable tensile tester.

146. Duro Engineering Co.—Information on Duro's standard and "Durogon" holders and name and address of nearest distributor.

147. Electrons, Inc.—Write for further information on industrial thyratrons for automation.

148. Fibre-Metal Products Co.—Data available on "SuperLite" aluminum safety cap and other safety equipment.

149. Flood Safety Products Co.—Information available on fiber glass helmets manufactured by Flood, and other welding and safety equipment.

150. Goldsmith Brothers Smelting & Refining Co.—For complete information on low temperature silver brazing write for a copy of the GB data book.

151. H & M Pipe Beveling Machine Co.—Complete details on H & M pipe beveling machines.

152. Handy & Harman—Bulletin 20 "Easy-Flo and Sil-Fos" tells why and how high speed, strength and economy are inherent in silver alloy brazing.

153. Harrisburg Steel Co.—Further information available on mobile gas storage.

154. Hobart Brothers Co.—Complete information available on the new DC Welder-AC Power Combination.

155. Hobart Brothers Co.—Write for further information on DC Rectifier Welder and "Rocket 101P" electrodes.

156. Independent Engineering Co.—Further information available on transporting gases by gas supply trailers.

157. International Nickel Co.—Write for booklet, "Repair Cast Iron Parts Quickly and Easily."

158. Invincible Vacuum Cleaner Mfg. Co.—Send for folder on Invincible Flux Recovery Systems.

159. Jackson Products—Data available on Jackson's insulated copper alloy holders, ground clamps, cable connectors and splicers.

160. Johns Manville Corp.—Brochure TX-2A explains the J-M "Aluminized Asbestos Cloth."

161. Lenco Inc.—Booklet, "Reducing Costs by Proper care of Arc Welding Circuits" available.

162. Lincoln Electric Co.—Write for the new Weldirectory Bulletin 7000.1.

163. Linde Co.—Write for further information on "Oxweld" No. 25 M Flux-Coated Bronze Rod.

164. Linde Co.—Further information on the "Heliarc HW-18" hand welding torch, and where you can examine and try it.

165. Liquid Carbonic—Write for a copy of technical and operating data on Liquid Carbonic's new all CO_2 metal-arc gas shielded welding.

166. Manhattan Rubber Div.—Data available on Manhattan's reinforced "Cut-Off Wheels."

167. McKay Co.—Write for the new McKay "Hard Surfacing" catalog.

168. Merrill Brothers—Information on lifting clamps, twin and drum lifters, drum tilters and other material-handling devices.

169. Metal & Thermit Corp.—Write for Hard Surfacing fact file on convenient 3" x 5" cards.

(Continued on page 90)

WELDING INFO-AIDS

USE THIS CARD for Literature, Catalogs, and Bulletins shown on preceding pages and for those featured in this month's ads as listed opposite and on following page

Also information about

NEW PRODUCTS described on pages 62 to 72

Every month WELDING ENGINEER lists many new catalogs and bulletins available from manufacturers. All are yours for the asking. However, this service is valuable to you only if you use it.

USE POSTPAID CARD →

★ For copies of any manufacturers' bulletins described on these pages, circle the number of the items on card at right. Fill in your name, title, company and address. This has to be done only once on either post card. You need no postage.

★ For additional information on New Products described in this issue, circle the numbers of the items that interest you. The New Products section begins on page 62.

WARNING!

Illegible or incomplete addresses may keep you from receiving the information you desire. And remember, cards postmarked after the deadline date cannot be processed.

★ **Post card not valid after three (3) months. After that time has elapsed, use your own letterhead to describe fully the information and/or literature wanted.**

Name_____ Title_____

Company_____

Address_____

City_____ State_____ 9/58

NOT GOOD AFTER DECEMBER 1, 1958

WELDING ENGINEER, P. O. Box 28, Morton Grove, Ill.

Please send me without obligation further information about the following:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
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Postage Will Be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD

First Class Permit No. 32, Morton Grove, Ill.

Welding Info-Aids,
Welding Engineer
P.O. Box 28
Morton Grove, Ill.

Literature offered in ads

(Continued from page 88)

170. Metallizing Engineering Co., Inc.—Bulletin 139 available on tungsten carbide hard facing with the "Metco" Thermo-Spray Gun.

171. Miller Electric Mfg. Co. Inc.—Complete particulars, specifications and prices on Miller welders including the new "Lectro Spot" welder.

172. National Carbide Co.—Information on calcium carbide available, also name of nearest distributor.

173. National Welding Equipment Co.—Brochure No. 4 is available on National's welding equipment.

174. Page Steel & Wire Div.—Welding Wire Comparison Chart DH-1218; Submerged arc and inert gas welding wire folder DH-402A; Gas welding rod booklet DH-1277 and Welding wire packaging charts are all available.

175. Phelps Dodge Copper Products Corp.—Write for further information on Phelps Dodge "Habirprene" arc welding cable.

176. Phoenix Products Co.—Literature available on latest rod-drying methods, "Dry Rod as Standard Welding Equipment."

177. Pressed Steel Tank Co.—Write for detailed facts and prices on Hackney high pressure gas cylinders.

178. Rankin Mfg. Co.—Ran-Check-Charts and Stickers available to promote regular inspection of equipment parts.

179. Scientific Electric Co.—Write if interested in free demonstration of the induction heater.

180. Singer Glove Mfg. Co.—Catalog on Singer's complete line of work gloves and safety clothing.

181. Smith Welding Equipment Corp.—Further information available on the "Big 98" welding and cutting outfit.

182. Smith Welding Equipment Corp.—Write for more information on the "Handi-Heet" torch kit.

183. Square D Co.—Write for bulletin 8993 on Square D electronic welder control.

184. Stulz-Sickles Co.—Write for "How-to-do-it" bulletin and name and address of nearest distributor.

185. Sylvania Electric Products Inc.—Information on color coded Tungsten electrodes.

186. Tec Torch Co.—Write for full information on the Tec "Visuweld" Torch and other "Visuweld" equipment.

187. Tempil Corp.—Information and sample pellets of temperature indicators; state temperature desired.

188. Tennessee Fabricating Co.—Catalog available, "Everything for the Ornamental Iron Shop."

189. Tillman & Co., John—Write for catalog on weldor's gloves and garments.

190. Tuffaloy Dept., Air Reduction Sales Co.—Catalog and prices available on Tuffaloy spot welding tips, tip holders and adapters.

191. United Wire & Supply Corp.—"Low Temperature Brazing Engineering Facts and Data" available.

192. Victor Equipment Co.—Write for further information on Victor's torches and tips.

193. Worthington Corp.—Further information on welding positioners available.

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P.O. Box 28
Morton Grove, Ill.

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Company_____

Address_____

City_____ State_____ 9/58

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Opinions vary on the preferred tipping method but—

SYLVANIA
TUNGSTEN ELECTRODES
MANUFACTURED BY SYLVANIA ELECTRIC PRODUCTS INC. CHEMICAL & METALLURGICAL DIV. TOWANDA PA. U.S.A.

most welders agree on the preferred electrode

Welders say they prefer Sylvania Tungsten Electrodes because they tip easily and economically. Now Sylvania packs money-saving information on tipping with every package of welding electrodes. The leaflet "How to Avoid Waste" presents methods for proper re-tipping which are the results of experience and research.

It's just one more reason why, more than ever, welders prefer Sylvania electrodes and why your welding supply distributor is happy to serve you with the industry's only complete line.

Remember too, that for further protection against waste, Sylvania electrodes are color-coded and packed in a protective wood filler.

Ask your distributor for Sylvania next time you order.

TUNGSTEN • MOLYBDENUM • CHEMICALS • PHOSPHORS • SEMICONDUCTORS

SYLVANIA

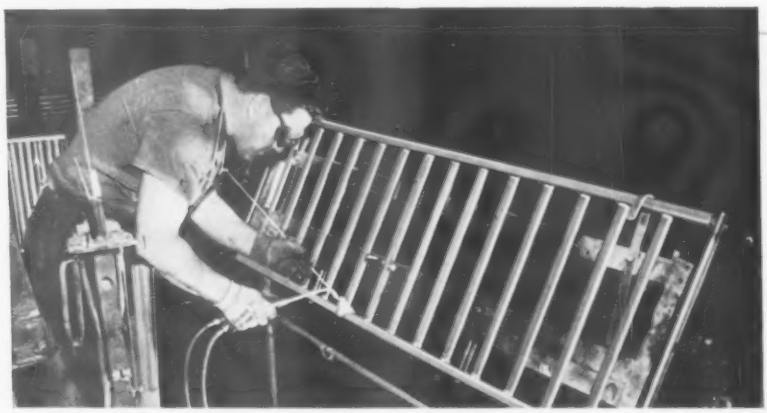
SYLVANIA ELECTRIC PRODUCTS INC.
Chemical & Metallurgical Div.
Towanda, Penna.

LIGHTING • TELEVISION • RADIO • ELECTRONICS • PHOTOGRAPHY • CHEMISTRY-METALLURGY

WELDING CLINIC

J. Imperati and R. F. Pulver, Welding Engineers
The American Brass Company, Waterbury, Conn.

Steel products are quickly and economically assembled by Braze Welding



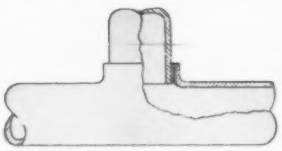
Side of a hospital bed being assembled at Simmons Co., Kenosha, Wisc., by braze welding with Anaconda-997 (Low Fuming) Bronze Welding Rod.

Oxyacetylene braze welding is widely used for economical assembly of many steel articles which do not lend themselves to joining by arc welding or resistance spot welding. Many are made from steel tubing and include school and office furniture; frames for motor scooters, bicycles, and wheeled toys; handles for portable saws, generator sets, and other equipment, etc. Others, made from sheet and strip, rods, castings and forgings, are storm sash and screen frames, auto-body and mechanical parts, wrought-iron furniture and decorative items, office furniture, cabinets and enclosures for sinks, refrigerators, ovens, etc.

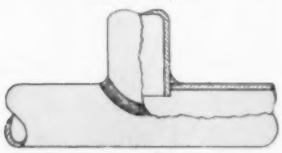
The advantages of braze welding are low temperature of application, excellent control of weld metal, low-cost joint preparation, and simple holding-fixture or jig design needed for efficient production. These advantages are fully realized by use of Anaconda-997 (Low Fuming) Bronze, Tobin Bronze*-481, and Nickel Silver-828. Since the low temperatures employed do not melt the steel, the weld metal is easily controlled to form smooth joints and fillets, and, in contrast to fusion welding, there is no need for skilled manipulation of flame and welding rod. The low temperatures needed and the excellent ductility of the weld metal also eliminate most of the tendency to cause distortion.

Simple fixture design. In most cases the joints are of such size that they can be made in a single step by heating from one side only. This simplifies fixture design and reduces handling operations.

Low-cost joint preparation. The molten braze-welding alloys easily bridge the gaps resulting from poor fit-up, and readily build up smooth fillets to develop maximum joint strengths. Cost of joint preparation is the lowest possible since there is no need for the accurately fitted laps required in the usual brazed lap joint.



Brazed lap joint



Bronze-welded joint

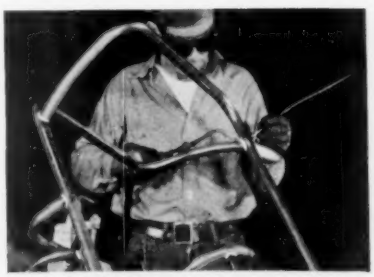
Vapor fluxing. A widely used adjunct to braze-welding operations is a vapor-fluxing device, installed in the fuel-gas line, to supply a uniform, small amount of flux through the flame. In this way, the joint surfaces are protected from oxidation just as soon as heating is started, and the braze-welding operation is expedited through complete fluxing, increased weld fluidity, less tendency to fume, and elimination of separate fluxing operations.

For more information. Anaconda distributors will gladly help in the selection of the exact rod for your job. Or write for a copy of new Publication B-13. Address: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

58104

Steel file cabinet panel has corners braze welded with Anaconda-997 rod.

ANACONDA®
WELDING RODS
made by
The American Brass Company



Tubular steel chair-desk frame is assembled on a revolving fixture by braze welding with Anaconda-997 rod—23 braze welds per unit, in 17 minutes.